Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 34 SEPTEMBER, 1920 No. 3

Flying Anglers Troll for Deep-Sea Fish

BY JOHN EDWIN HOGG

TROLLING for deep-sea game fish from the gondola of a low-flying dirigible, locating schools of fish from the air, and then tossing the hooks to them from the air, is the newest twist to angling pastimes to attract the attention of American sportsmen.

The first dirigible fishing expedition was carried out, on July 7, by a party of Los Angeles sportsmen who flew from the city in a pony blimp to a point about 12 miles north and out to sea, from the harbor. The trip of 35 miles was accomplished in 50 minutes in spite of delays from a low-hanging fog which made flight by compass necessary part of the way.

With some light fishing tackle the flying anglers made a landing in Portuguese Bay, about 10 miles north of Los Angeles. Here an hour or two was spent at "still fishing" for small herring and smelts. Using these small fish for bait, a number of large barracuda and mackerel were caught, necessitating the dumping of considerable ballast to prevent the airship from being pulled down by the increased weight.

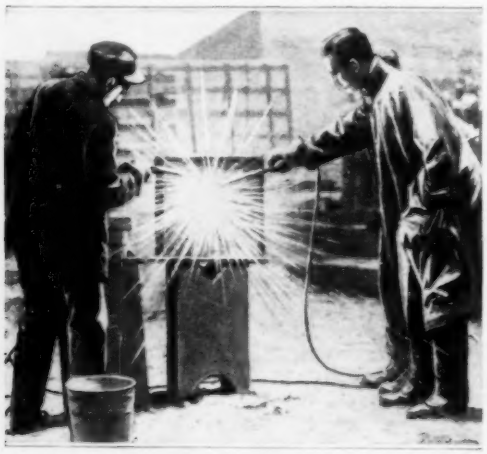
While trolling at an elevation of some 30 ft. and about 10 miles from land, the big thrill of the expedition came when an

Left: The Aerial Anglers Still-Fishing from the Gondola of the Dirigible as It Rests on the Surface, One of Them in the Act of Removing a Big Barracuda from His Hook. Buckets of Water are Used for Ballast, and are Easily Emptied When Arising. Above: Trolling from the Dirigible at an Elevation of About 30 Feet above the Water, with the Machine Running at an Approximate Speed of Six Miles an Hour. The Bait Used on the Troll Lines Consisted of Small Herring and Smelts. Also Caught by Still-Fishing from the Airship

eight-foot shark swallowed a big mackerel that one of the flying fishermen was reeling in. Several hundred feet of line were unreeled before the shark's run was checked. Then he began towing the aircraft after its motor had been shut down. A number of times the airship was pulled down by the big fish until its pontoons rested on the water. After a 30-minute battle with the shark the flying anglers realized that the great fish could not be brought aboard without the necessity of dumping a quantity of ballast, more to be desired at that moment than the shark itself. Accordingly, a fisherman drew his knife, and was about to cut the line when the shark wiggled off the hook. After catching as many fish as could be used the aerial fishermen flew back to Los Angeles, making the trip in 40 minutes.

STRONG VAULT-LINING METAL RESISTS ACETYLENE TORCH

Ability to resist the most potent cutting tool so far known, the acetylene torch, is the remarkable characteristic of a bur-



Acetylene-Torch Experts Trying Vainly to Cut through a Plate of the New Burglar-Proof Metal

glar-proof alloy now being used for lining bank vaults and safes. In an official test, a 4-in. plate of the material showed only a small hole, 2⅛ in. deep, after nearly four hours' work with a cutting flame. In another trial, experts using two torches succeeded in burning a 1-in. hole through a plate with 300 cu. ft. of oxygen and 200 cu. ft. of acetylene, 14 torch tips being spoiled in the work. The same flame cut through a 4-in. steel plate in 24 seconds. It was estimated that a hole large enough for a burglar's entrance would require 40 tanks of oxygen and 10 of acetylene, and occupy two men for two days.

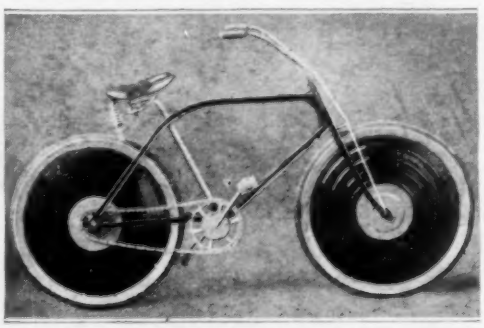
¶Tree trunks of square cross section are now the goal of an English school of forestry as a result of a recent investigation into the gardening practice of slitting and bruising the bark to stimulate the growth of wood.

NEW LUBRICANT REMOVES RUST AND DEPOSITS GRAPHITE

Remarkable qualities are claimed for a new kind of lubricant, compounded by an Ohio inventor. Graphite is carried in suspension by an oil of great penetrating power, so that when a few drops of it are placed on one side of an automobile spring, for example, it soon oozes through to the other side, leaving a film of graphite between the leaves, without any need of separating them for the application. Its value is increased by its property of cleaning away all rust and dirt in its path.

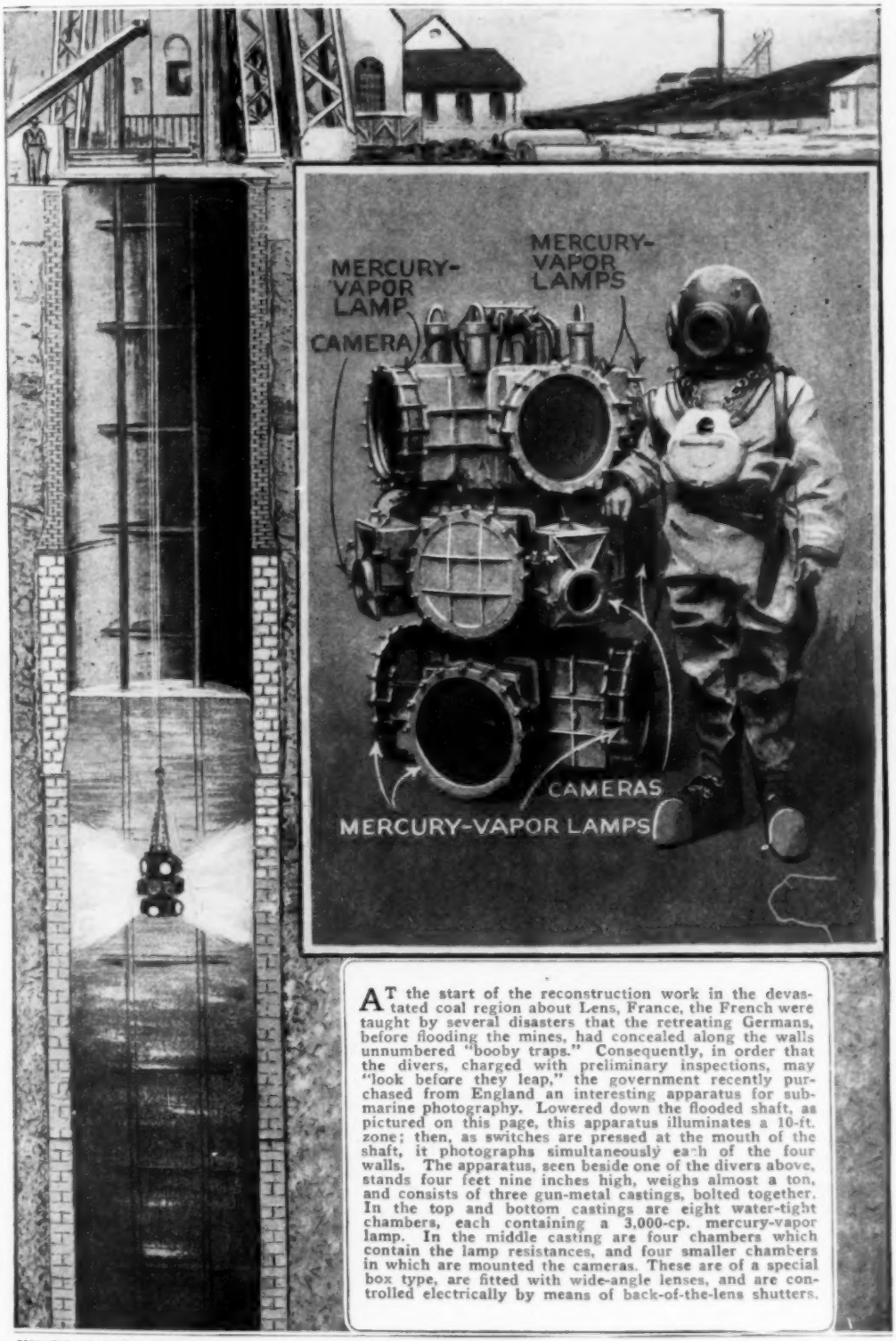
NO SPOKES OR TUBULAR FRAME MEMBERS IN LATEST BICYCLE

Bicycles, in the construction of which no spokes or tubular frame members are used, are now being marketed at a surprisingly low price by an American manufacturer. Welding is the operation most often performed in the assembly of the parts. Thus, to the two diamond-shaped pieces of angle iron which form the frame, there are welded the seat post, the lugs for the sprocket housing, and the hinged bracket for the front fork. The fork, further, is simply a length of angle iron bent into U-shape. The wheels are formed of steel disks welded along their circumferences to the steel rims, and at their centers to ordinary bicycle hubs.



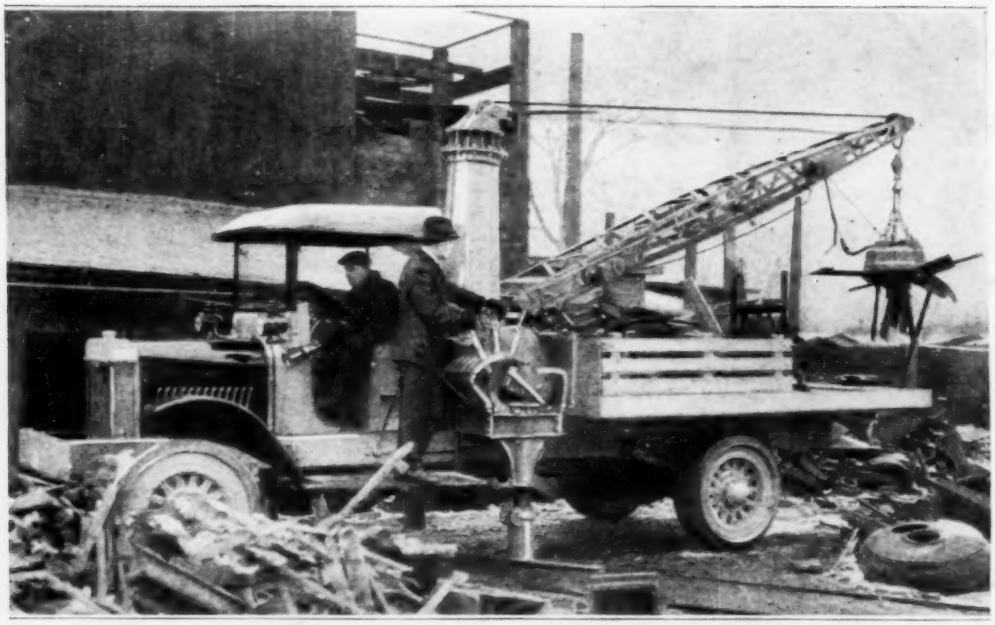
The Frame and Front Fork of This Low-Priced, Practically Indestructible Bicycle are Formed of Angle Iron. To These the Other Fixed Members are Welded

CAMERA DETECTS TRAPS IN FLOODED MINES



AT the start of the reconstruction work in the devastated coal region about Lens, France, the French were taught by several disasters that the retreating Germans, before flooding the mines, had concealed along the walls unnumbered "booby traps." Consequently, in order that the divers, charged with preliminary inspections, may "look before they leap," the government recently purchased from England an interesting apparatus for submarine photography. Lowered down the flooded shaft, as pictured on this page, this apparatus illuminates a 10-ft. zone; then, as switches are pressed at the mouth of the shaft, it photographs simultaneously each of the four walls. The apparatus, seen beside one of the divers above, stands four feet nine inches high, weighs almost a ton, and consists of three gun-metal castings, bolted together. In the top and bottom castings are eight water-tight chambers, each containing a 3,000-cp. mercury-vapor lamp. In the middle casting are four chambers which contain the lamp resistances, and four smaller chambers in which are mounted the cameras. These are of a special box type, are fitted with wide-angle lenses, and are controlled electrically by means of back-of-the-lens shutters.

COPYRIGHT, ILLUSTRATED LONDON NEWS



The Magnet-Crane Motor Truck is being Used Here to Handle Scrap Iron. The Stabilizing Jacks at Either Side have been Screwed Down into Contact with the Road. Beneath the Operator's Hands Are the Five Control Levers

WOMEN SHOOT IN DARKNESS USING LUMINOUS SIGHTS

Realizing that the law-abiding citizen usually encounters highwayman or housebreaker in the sunless hours, leaders of the Women's Motor Corps of New York City staged their recent pistol-shooting contest in the darkness of an underground gallery. Only the target was illuminated. As few of the contestants were experienced "snap shots," however, the sights of the weapons had to be covered with a radioactive preparation. To the winner a citizen of the city presented a handsome trophy.

COPYRIGHT, KEYSTONE VIEW CO.

On the Sights of the Firearm Glows the Radioactive Preparation Applied to Make Possible the "Lightless" Shooting Contest

MAGNET-CRANE MOTOR TRUCK HANDLES SCRAP IRON

A motor truck equipped with a magnet crane has recently been introduced by a Michigan manufacturer for unloading carloads of iron, for handling scrap, and for similar purposes. As clamped to the chassis frame, between the driver's seat and the body of the truck, the magnet-crane attachment consists of the crane itself, two stabilizing jacks of screw type, and the magnet. Like the crane, the magnet, with its capacity of 1,500 lb., is energized by the engine of the truck. If used without the magnet, the crane will lift a weight of three tons at eight ft., and of one and a half at 14 feet.

AIRPLANE CARRIES RESTAURANT OWNER ON INSPECTION TRIPS

Officers of the army air service must now share the distinction of making their trips of inspection by airplane with a Canadian of Chinese birth. This Chinaman operates a string of restaurants in Toronto and other cities of western Ontario, and has lately learned that much time can be saved by making his rounds by way of the air. A two-seater plane of the familiar training type is used. Army men will be amused to learn, otherwise, that this restaurant owner's name is Chow.

BEAUTIFUL FACES TRANSLATED INTO MUSIC

Machines Render Profiles in Jazz or Classic, According to Nature's Mood

By HARRY A. MOUNT

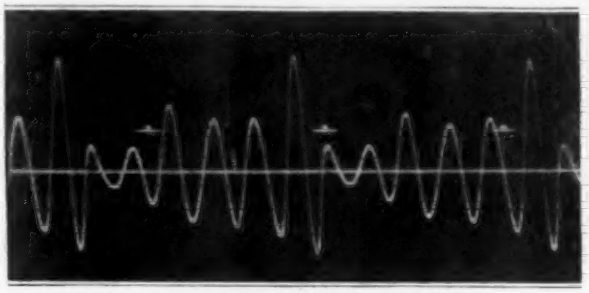
A BEAUTIFUL face is a symphony of vision. And there's nothing sentimental about that, either. It is a cold scientific fact, capable of demonstration just as conclusively as is a geometric theorem.

For the curves that make a beautiful profile can be translated into sound and the result will be perfect harmony. And this harmony, in turn, can be caught by the camera—actually photographed — and the result is a reproduction of the lines of the profile.

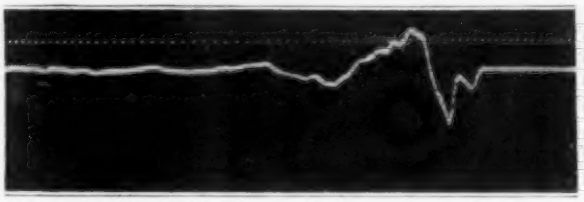
Such an experiment has recently been performed by Dr. Dayton C. Miller, of the Case School of Applied Science, Cleveland, who is well-known in the scientific world as an authority on the physical nature of sounds. To many, the experiment may seem to have little of practical value in it, but to the scientist it is rich in possibilities. It suggests the reply to an age-old question for which there has never been found an adequate answer: what is beauty?

There are almost as many answers to the question as there are persons in the world, for each sees beauty a little differently. To the astronomer the most beautiful thing might be some particular star; to the musician the tone of some particular instrument; to the poet some bit of sentiment.

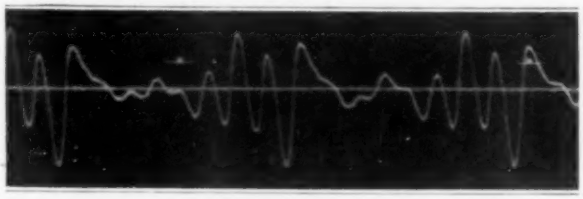
The experiment proves that there is a unity in beauty which we have heretofore little suspected. For instance, we take the beautiful profile of a girl, translate it into a form understandable to the ear and we again have beauty. Conclusive proof that the thing we have done is not just an accident lies in the fact that the beautiful sound can be again turned back into the lines of the profile.



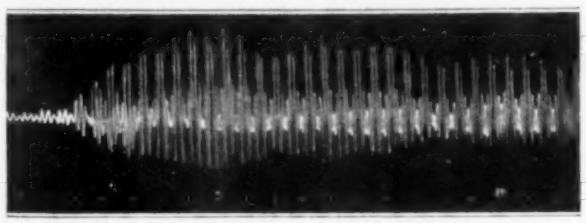
A Photograph, Taken with the Aid of the Phonodeik, Showing the Wave Form of a French Horn's Beautiful Low Tone



The Harsh and Unlovely Record of a Cannon's Boom, Illustrating the Difference between Musical Tone and Mere Noise



A Phonodeik Record of the Sound of "A" as in "Father," a Tone of Much Beauty Both Aurally and Visually



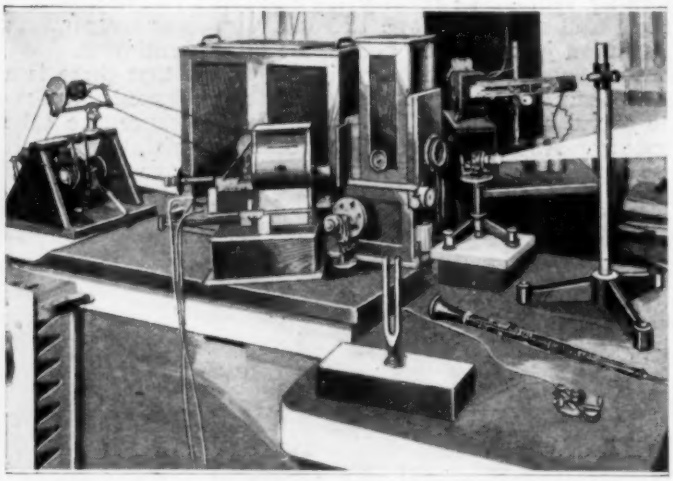
The Photographic Record of a Spoken Word, Interesting but without Special Beauty: The Scale along the Lower Edge of the Film Indicates the Duration of the Sound in Hundredths of a Second

Music is the most subtle of the fine arts, and its enjoyment consists entirely in the appreciation of abstract beauty. It is abstract because it is presented to us through the sense of hearing and it does not exist in a material form of which we are conscious. And yet music appeals to more people than any other fine art.

And now we find that the appeals of beauty which we perceive through our other senses, as sight, are the same in their essential characteristics as that of music. In a final analysis we

must recognize that there is only one intellectual center, or brain, that perceives beauty and its criteria of beauty are the same through whatever sense perceived.

Away back in 1822, Baron Fourier of Paris published *La Theorie Analytique de la Chaleur* (The Analytical Theory of Heat), in which he gave a theoretical explanation of the transmission of heat, as from one end of an iron poker in the fire to the handle. In doing so he developed a new mathematical process, known as Fourier's theorem, which was destined to become of very great importance in other lines of scientific investigation. This theorem has been most elaborately developed in the study of the complicated wave motions which constitute harmonious sounds of music, and hence it is often called harmonic analysis.

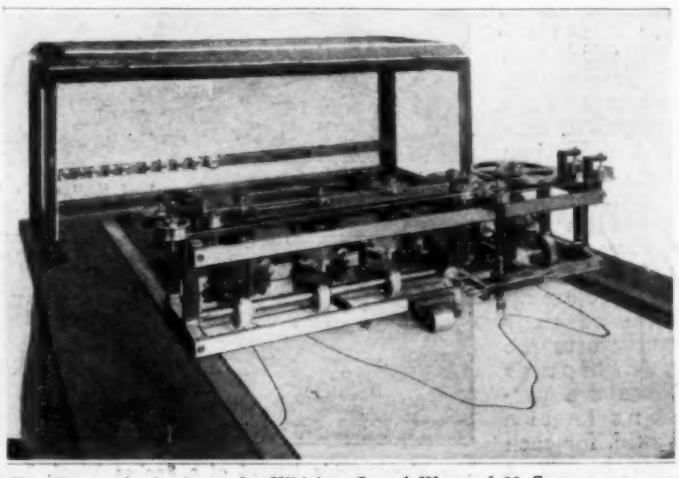


The Mechanism of the Phonodeik: The Long Horn at the Right, Resembling a Beam of Light, Collects the Sound Waves for the Diaphragm and Its Oscillating Mirror. At the Left Are the Arc Light, the Revolving Mirrors, and the Motor That Drives Them

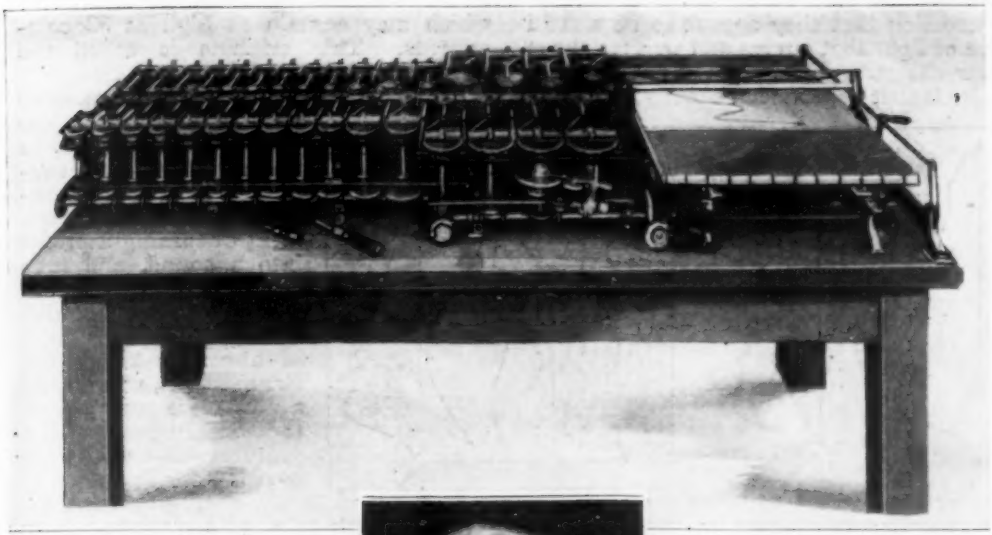
In 1844, Ohm of Munich definitely announced the principle that beautiful musical sounds are complexes, made up of separate, simple component waves, and he asserted that the trained musical ear could hear the separate components; that is, that sound can be analyzed by ear. By such a method as that now used in making phonograph records, and better still by the photographic method of the "Phonodeik," an instrument devised by Doctor Miller, it is possible to obtain records of the shapes of these complex musical waves. The trained ear can analyze the sounds, but the eye cannot analyze the curves. By the application of Fourier's theorem, however, the curves can be analyzed in a manner corresponding exactly to analysis of the sounds by the ear.

Such investigations show that all sounds which are musical, as distinguished from noise, are always made up of simple tones, which, when represented by curves can be analyzed into composite curves which seem to flow smoothly with rounded bends and symmetrical groupings. The richer the tone, the more complex its wave form, but it is always beautiful in outline and smoothly flowing. The discordant musical sounds and noises, on the other hand, are represented by waves which have kinks, sharp points, zigzags, and other irregularities.

The mere form of the wave of harmony is pleasing to the eye, as the photograph of the beautiful low tone of a French horn shows. In marked contrast to this is the photograph of a noise—the boom of a cannon. A further contrast is the



The Harmonic Analyzer, by Which a Sound Wave of 30 Components may be Resolved Mathematically into Its Elements and the Individual Waves Found by a Simple Mechanical Process. By This Means the Human Profile may be Analyzed

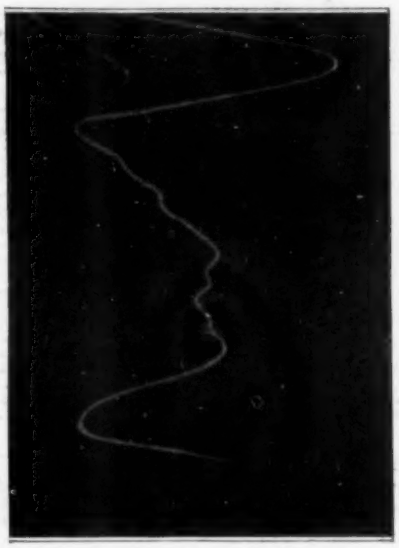


Above: The Harmonic Synthesizer, Which Combines the Wave Forms of Simple Tones into a Composite Record of Harmony or Discord, as the Case may Be

Left: The Profile of a Famous Motion-Picture Actress, Selected for the Experiment of Translating Facial Curves into a Harmonious Composite of Sound Waves

spoken vowel "a," as in father—one of the simplest and most beautiful of the spoken sounds and most often used by teachers of voice culture. The Italian tongue is rich in this sound and is therefore a favorite with singers. On the other hand, the photograph of a spoken word, shown elsewhere, has little or no beauty.

When an investigator wishes to study a sound, he first obtains a photograph of the sound, by the use of the phonodeik. This instrument is a boxlike arrangement from which projects a phonograph horn. In fact, at first glance it appears to be a sort of crude phonograph. The phonograph horn, however, is for the purpose of collecting sound waves, not sending them, and at its tip is a simple diaphragm. To the center of this diaphragm is attached a very fine piece of silk fiber, wound once around an upright spindle, and held by a spring. Each vibration of the diaphragm, therefore, pulls the fiber back and forth and causes the spindle to turn from side to side. A mirror of almost microscopic proportions is attached to this spindle, and a spot of light from an arc lamp, admitted through a pinhole, falls on this mirror and is reflected by it. When the diaphragm is in motion, therefore, the light dances from side to side.

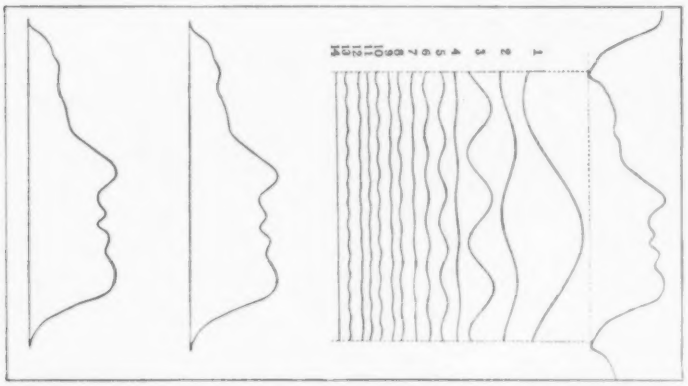


Tone Record of a French Horn, Which First Suggested the Test of a Human Profile

This spot of light falls on a wheel, which has its outer rim lined with a series of little flat mirrors. This wheel is revolved by an electric motor. The result is that the spot of light is reflected from the wheel to a ground-glass screen, as a series of dots of light that pass from the top to the bottom and again to the top of the screen, and so forth, at the same time oscillating with the movement of the sound diaphragm. The dots of light follow each other across the screen in such rapid

succession that they appear to be a solid line of light that curves and writhes about over the screen like a thing alive.

In fact it reproduces exactly the wave



Left to Right: The Selected Profile, Its Synthetic Curve, the 14 Simple Components, and the Profile Reproduced Again by Combining Them with the Harmonic Synthesizer

form of the original sound. To photograph the wave form, it is only necessary to allow the reflected dot of light to fall on a revolving film, instead of the mirror wheel. A tuning-fork device, electrically operated, throws dashes of light on the film to indicate the time duration of the recorded waves.

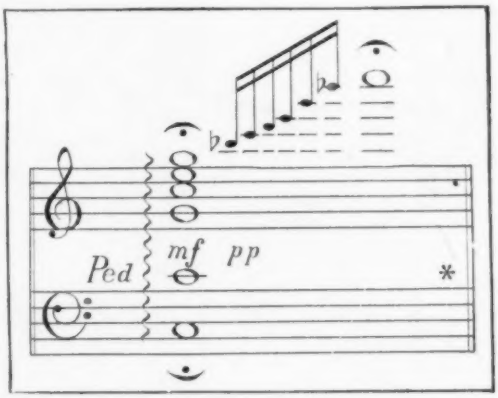
Once the photograph is secured, it is analyzed by the application of Fourier's theorem, to determine the component tones present and to learn how harmoniously they blend. The numerical application of Fourier's theorem involves difficult calculations based on integral calculus. But just as we have adding machines to solve problems in simple arithmetic, we have machines to "do" calculus problems, and the equation of a curve may be found by the easy mechanical operation of a "harmonic analyzer."

If we wish to learn the effect that will be produced by the combination of certain simple tones, the natural method would be to sound the several components and listen to the result. But this method is not always convenient, and for purposes of a preliminary study, it is more suitable in the laboratory to draw a composite curve made up of the simple curves in combination. The first machine of this kind was made in 1876 by Lord Kelvin, to predict the tides of the ocean. Later Professor Michelson of the University of Chicago devised a similar machine for studying composite waves of light. More recently Doctor Miller has constructed the most elaborate machine of the kind yet made for studying musical sounds, which may contain as high as 32 components. This machine is called the "harmonic synthesizer."

Here we have, then, the instruments used in making the experiments referred to in the beginning of this article. It is a rather curious fact that the experiment of turning a profile into a sound, and then back again into a profile, was inspired by the discovery of the photograph of a certain tone of a French horn, which bore a very close resemblance to a human profile. The progress of the experiment was as follows:

A photographic negative of a pleasing profile was placed in a projecting lantern and the image was thrown on a sheet of paper. The profile was accurately traced. The curve was then analyzed by the "harmonic analyzer," and found to consist of 14 components. The equation was "proved" by setting up the 14 simple components on the harmonic synthesizer. The curve, as actually drawn by the machine, is shown in one of the illustrations.

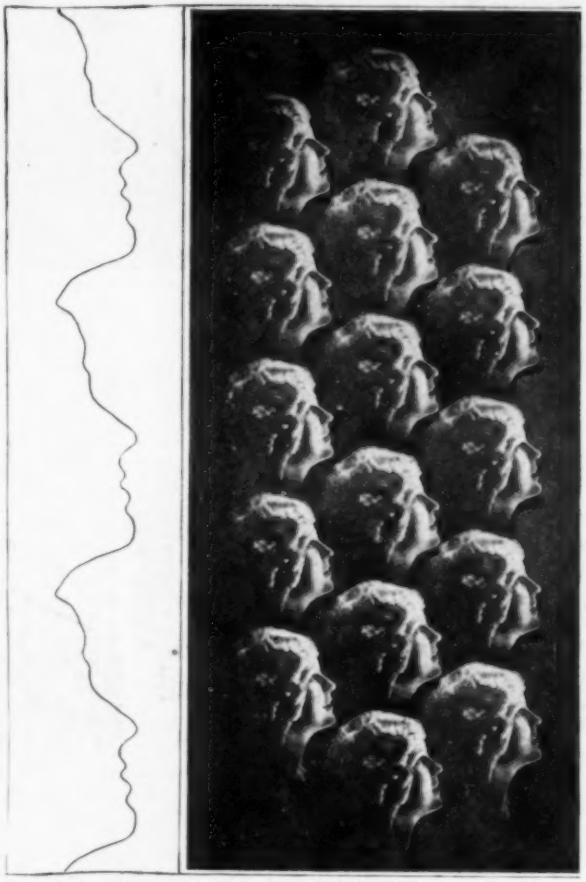
Musical sound waves are often represented by waves of this general character, but the word wave is generally considered as a succession of similar forms, and if it is repeated, as shown in one instance, it represents a wave motion similar to the sustained sound of a musical tone. If all



A Musical Chord, Produced by 14 Organ Pipes, Giving a Composite Wave Exactly Corresponding to the Human Profile

the details of the portrait are repeated, we should have a veritable sea of faces.

If, upon looking upon such a sea of faces, we should facetiously ask, "What are the wild waves saying?" Doctor Miller would insist that these waves are by no means wild, but that they are in truth most harmonious and are singing a gentle song to the eye, which is as sweet and mellow as the tone of a French horn to the ear. The composite curve of this profile is to the eye just what a rich musical harmony is to the ear. The equation is equivalent to the musical notation of the chord represented in another illustration.



The Successive Composite Wave of Harmony at the Left Is the Musical Counterpart of the Beautiful "Sea of Faces" Depicted at the Right

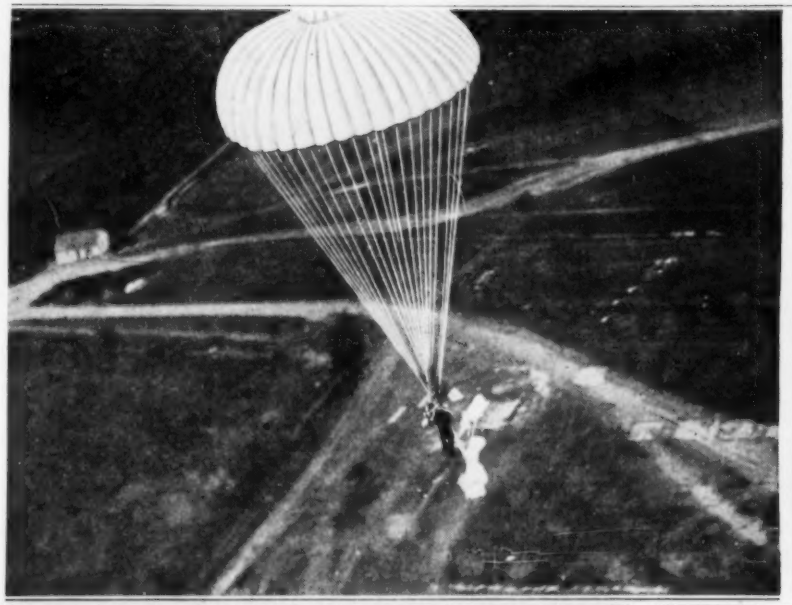
And not only is this analysis possible, but the harmonious musical notes which the component curves in the profile represent, can be combined to produce a wave form in the air, which, when protographed, will be a reproduction of the photograph. This is done by selecting 14 organ pipes, delicately voiced and accurately toned. These are all set up in a miniature organ and connected with a source of compressed air.

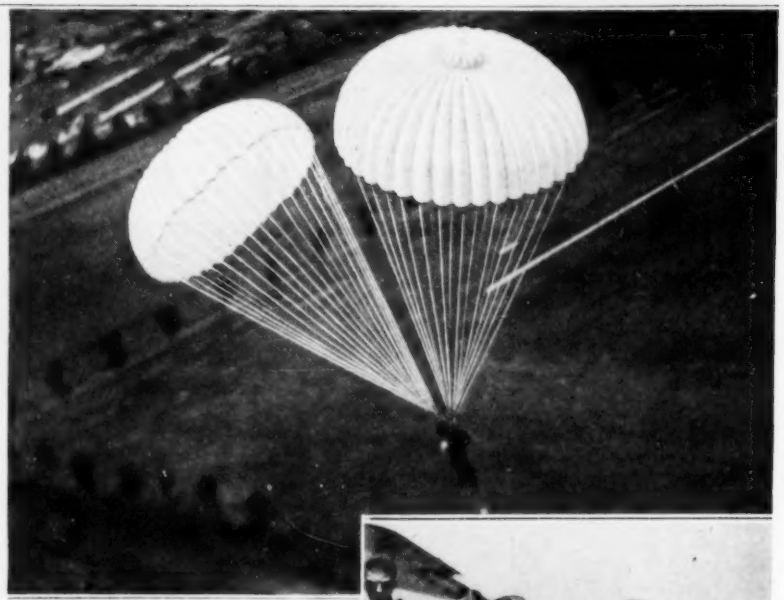
When all are sounded simultaneously the result is a chord in perfect harmony. If this harmony is photographed, the face is seen in the waveform. If we add a sharp chin or nose to the profile and reproduce it in sound there is at once noticeable a discord. Similarly a discordant note added to the "profile music" at once disfigures the beauty of the curve.

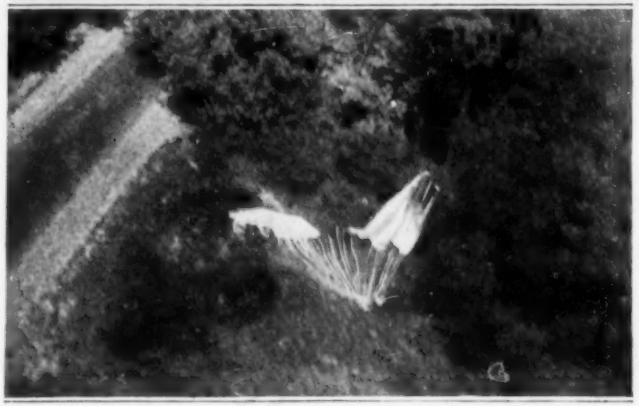
It is not at all unlikely that very similar methods will soon be applied to practical advantage in the study of voices, language, and the like. It will undoubtedly be used in the perfection of musical instruments and in the elimination of all sorts of noises.

ELECTRICAL OSMOSIS PURIFIES CLAY

The complex phenomenon of electrical osmosis, regarded for many years as a matter of purely academic interest, has lately been put to commercial use in Europe for the purification of the clays used in making glass and the finest chemical porcelain. Explanation of the term itself would be more involved than interesting; the new process, however, can be described in the space available. A wooden tank is employed, in which the impure clay, suspended in liquid, is kept in motion by paddles in the lower portion. Above the paddles is the cylindrical cathode, through holes in which the clay is passed. Receiving a negative charge here, the clay particles are attracted to the anode, with the effect that a nearly dry layer of pure clay is deposited thereon. Meanwhile the impurities, consisting of particles of mica, pyrites, free silica, etc., being indifferent to electrical osmosis, are simply washed away. The pure clay is scraped off the anode in the form of a blanket one quarter to one half of an inch thick.







PAIR OF PARACHUTES CHECKS AIRMAN'S LONG FALL

THOUGH the design and operation of parachutes have been the subject of practical experiments since the eighteenth century, the American Air Service is the first, it is believed, to test the action and interaction of parachutes used in pairs. In the experiments performed at Mitchell Field, Long Island, N. Y., a sergeant strapped one parachute upon his back, as usual, and a second upon his chest. Thus encumbered, he was carried, in a two-seater plane, to a height of approximately one mile. Here he walked out upon a wing, pulled the release of the rearward chute, and stepped into space. The white bag opened nicely, and he drifted down to within less than 1,000 ft. Here he pulled the second release, and the second parachute opened above him without entangling or interfering with the first. He has reached the ground, and the parachutes are collapsing upon him in the photograph at the left.

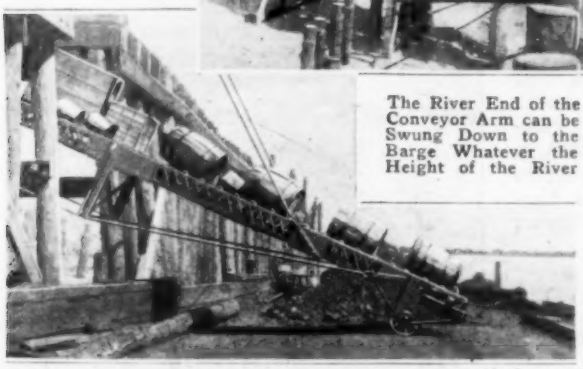
PHOTOS COPYRIGHT, KEYSTONE VIEW CO.

WHARF CONVEYOR MEETS ANY RIVER LEVEL

One of the stock arguments of opponents of waterway transportation is that river-barge cargoes must be lifted to the wharf by expensive labor or power, and that changing water levels create an obstacle to the efficient use of machinery. That this difficulty may easily be overcome is being demonstrated by a new electric conveyor recently installed at a southern Illinois railway terminal on the Mississippi River. At this point the stream's annual variation in height is about 20 feet, but it has been known to reach 39 feet.

The Long Conveyor Arm is Pivoted to the Wheeled Frame and is Supported by the Steel Boom

The River End of the Conveyor Arm can be Swung Down to the Barge Whatever the Height of the River



This Close-Up View of the Conveyor Arm was Taken from the Deck of a Barge. Articles of the Kind Pictured can be Handled at the Rate of 1,000 an Hour

The conveyor's power equipment, comprising electric motors, winding drums, gearing, and controls, is mounted on a wheeled frame on the wharf.

The conveying mechanism itself is carried by a long arm, pivoted to the frame and capable of a considerable range of vertical movement.

Projecting angularly above the arm, and connected to it by cables, is a steel boom, by which the conveyor may be promptly raised or lowered to meet the deck of a barge. In that position, cargoes are loaded or unloaded at a rapid rate. It is asserted that 1,000 pieces of freight can be handled in an hour. The whole installation cost less than $10,000 and displaces a large amount of manual labor. Additional conveyors of the same type will be provided as the traffic along the river increases and warrants it.

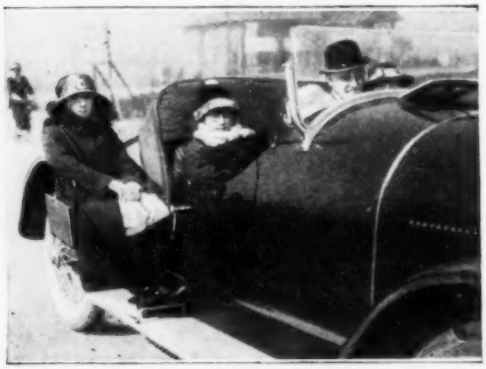
CITY WATER IN FLORIDA ABUNDANT

Florida is blessed with an abundance of water; not only are there hundreds of fresh-water lakes, but the whole state is underlaid with an apparently inexhaustible supply. The well driller can guarantee a good well in perfect confidence. The stratum is reached at about 150 ft. and is found below a layer of limestone. As a rule the wells flow freely, as in the illustration, which is of one of the artesian wells supplying the city of Jacksonville.

The Artesian Well Pictured Here is One of Those Supplying Jacksonville, Florida, with Water

ENGLISH ROADSTER HAS EXTRA SEATS ON RUNNING BOARDS

Autoists who prefer to drive cars of the roadster type sometimes display much in-



An English Roadster with Auxiliary Seats Just Ahead of the Rear Fenders, Giving Touring-Car Capacity

genuity in making odd provision for the occasional extra passenger. A powerful English car has been fitted this season with an auxiliary seat on each side, just in front of the rear fender. A solid outer side, surmounted by a rail, makes the outriding seat as safe as any, and even a footrail is provided by mounting a metal bar on the running board. With this equipment, the roadster accommodates as many passengers as a touring model.

BRICK HIGHWAY EXPLODED BY RISE OF TEMPERATURE

A "potential mine field," county engineers now call a 10-mile stretch of monolithic brick highway near Seattle, Wash., as a result of a recent peculiar and almost fatal explosion of its surface. This road has exploded less seriously a dozen times in the past, the records show, but never before so disastrously as upon this thirteenth time. The rear end of a passing motor truck was flipped into the air, throwing the occupants to the ground, while bricks soared to the tops of the telegraph poles. As in the previous cases, the explosion is believed to have been caused by the nonprovision of expansion spaces for the brick. Lacking them, the surface tends to buckle or explode.

In the Foreground is Seen the Highway Surface, Here Somewhat Repaired, Which Exploded beneath a Passing Truck

ONIONS IN MESH BAGS NOT ATTACKED BY MOIST ROT

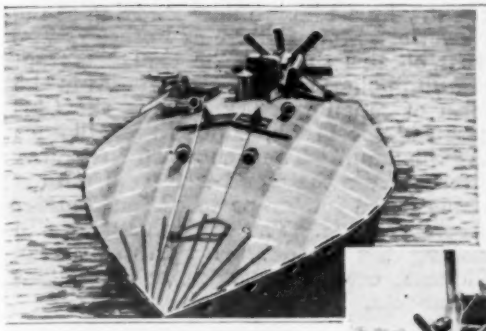
Experiments having proved that, when thoroughly ventilated, onions are not attacked by the moist rot which for many years has been a source of financial loss, the farmers of the Imperial Valley, in southern California, now ship their crop in mesh bags. These are made of a heavy jute or hemp fiber, woven so coarsely that

To Permit Circulation of Air and So Prevent the Dreaded Moist Rot, Onions from Southern California are Now Shipped in These Odd Mesh Bags

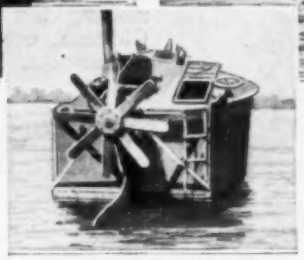
the air can circulate freely through the contents. The new bags are popular with the buyers, too, as a glance reveals the condition and quality of the onions.

QUEER HOUSEBOAT PROPELLED BY ENGINE AND AIR SCREW

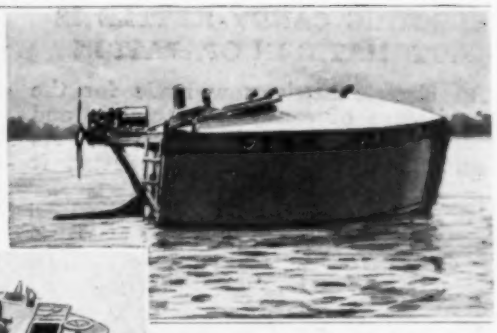
A small houseboat, as striking for its oddity of design as for its method of propulsion, last summer appeared on the inland waters of Canada. In design it is chiefly remarkable because, though only 23 ft. long, it is 11 ft. or almost half as wide. It is completely decked over, too, by a "roof" so humped that one can stand erect in any part of the hull. Admission to the hull is gained, as to the interior of a submarine, by means of a small hatch near the stern. Ten portholes on either side admit light and air. To propel this strange floating home there has been bolted to the stern a 20-hp. automobile



The Humped Roof is Seen in the Bow-On View, Above, of the Odd Houseboat. At the Stern Is the Power Unit



Stern View, Showing Eight-Bladed Propeller, Entrance Hatch, and Steering Wheel



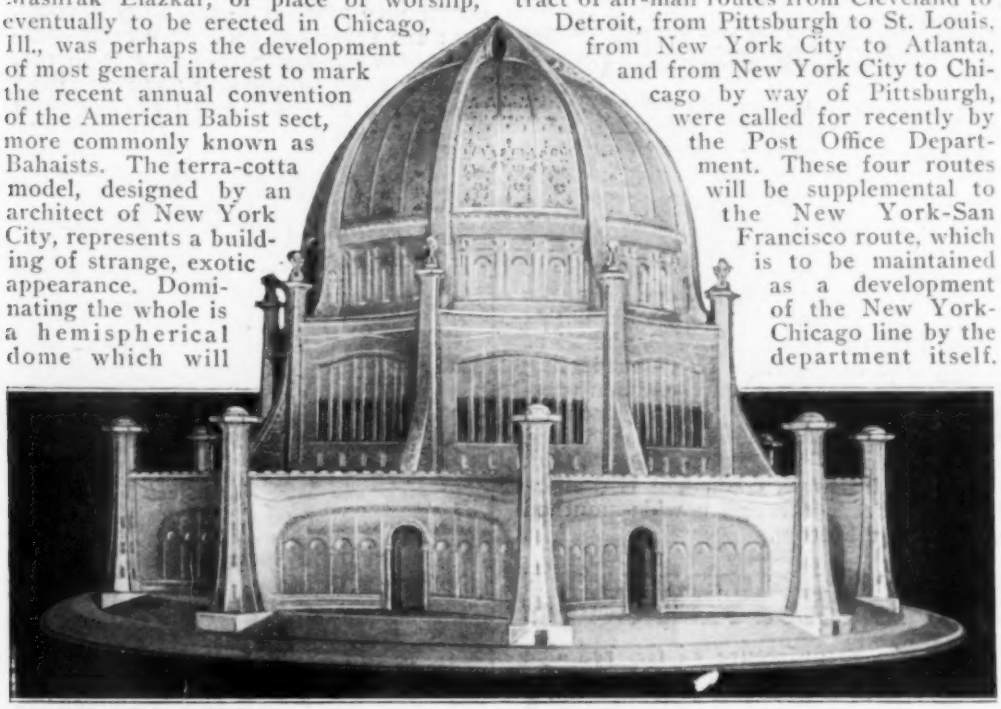
The Side View Brings Out the Unconventional Lines of the Craft and Explains the Mounting of the Propeller on the Frame at the Stern

engine which turns an evidently homemade propeller of eight blades to give a speed of six miles an hour. To impart stability to his craft, finally, the builder has fixed, not one, but five keels to the broad, flat bottom of the strange hull.

PERSIAN SECT PLANS STRANGE TEMPLE FOR CHICAGO

The choice of a design for the great Mashrak Elazkar, or place of worship, eventually to be erected in Chicago, Ill., was perhaps the development of most general interest to mark the recent annual convention of the American Babist sect, more commonly known as Bahaists. The terra-cotta model, designed by an architect of New York City, represents a building of strange, exotic appearance. Dominating the whole is a hemispherical dome which will rise to a height of 180 ft. Carved into a semblance of lacework, and backed by thousands of electric lights, it will be visible at night for miles. Supporting this dome will be a curious base of nine sides, each taking the form of a semicircular entrance court. The American Bahaists are adherents of the Babi religion, founded in Persia in the middle of the last century.

¶Proposals for the operation under contract of air-mail routes from Cleveland to Detroit, from Pittsburgh to St. Louis, from New York City to Atlanta, and from New York City to Chicago by way of Pittsburgh, were called for recently by the Post Office Department. These four routes will be supplemental to the New York-San Francisco route, which is to be maintained as a development of the New York-Chicago line by the department itself.



COPYRIGHT, UNDERWOOD & UNDERWOOD

This Terra-Cotta Model Represents a House of Worship, 180 Feet High, Which a Persian Religious Sect is Going to Erect in Chicago, Illinois. The Lacy Dome, and the Nine-Sided Base Are the Most Noteworthy Features of the Strange Design

ELECTRIC CANDY KETTLE IS AUTOMATIC IN OPERATION

An electric kettle now made for the manufacture of candy is automatic and practically fool-proof in operation. As mounted on its strap-iron pedestal, it

The Asbestos Insulation has been Removed from the Automatic Electric Candy Kettle Here to Show the Outer Wall

consists of a large copper container with double walls. Between these walls, in the bottom, are several heating elements which connect with the factory circuit. Between the walls, too, is poured the water which is to be turned to steam by the elements. The height of this water is shown by a glass gauge; above the gauge is fixed a safety valve. On the other side is an adjustable thermostat which keeps the contents of the kettle at the desired temperature by disconnecting the electric current when the steam pressure, and hence the temperature, becomes too great. The whole kettle is covered with asbestos to prevent heat loss. When the candy has been cooked, it is drained from the kettle through a wide-mouthed valve in the bottom.

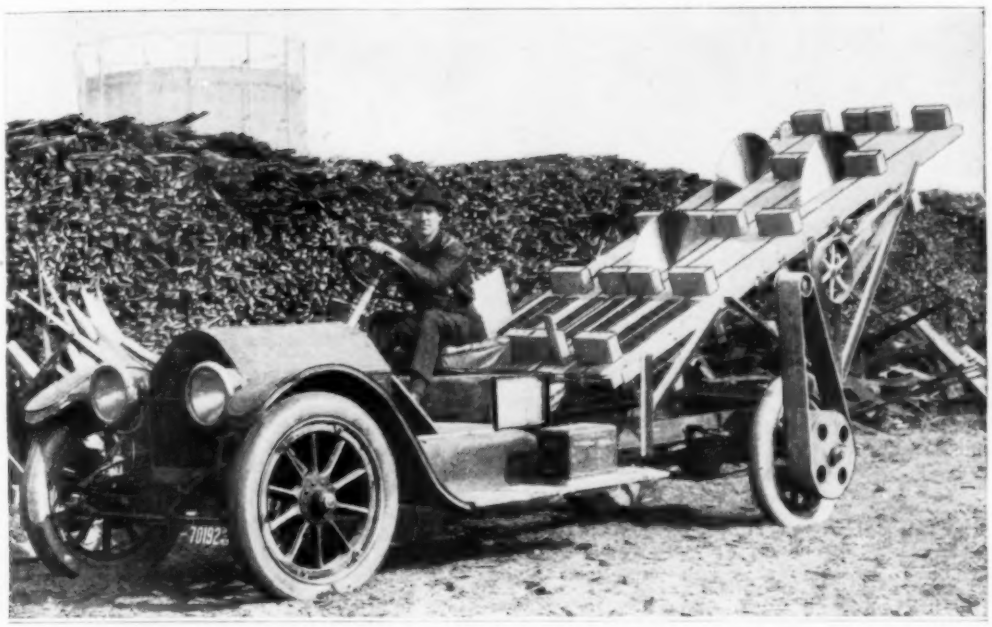
CHINESE TRUST CONTROLS DYE USED TO COLOR FIRECRACKERS

That the manufacture of the red dye used by the Chinese to color firecrackers for export to America is controlled by a native "trust" with headquarters in Hongkong is the intelligence brought to this country by a Filipino now studying at the New York State College of Forestry. The trust obtains this dye, he explains, from the Philippines and the East Indies in the form of sapan wood, known to the Chinese as "Soo Mook," and to the Filipinos as "Sibukau." The yellow stuff secured directly from the wood is treated until it yields a red ink or paste of the familiar firecracker hue. The dye is used also in making the florid seals with which the Chinese certify their more important documents.

ROD WITH SUCTION CUP ENDS PERIL OF SLIPPING LADDER

A ladder "stay," as it is called, is now marketed as the first contrivance of its kind. Its peculiar purpose is to make impossible the slipping, or skidding, of the ladder under the weight of the workman. To accomplish this, the stay is made in two parts: the first, a clamp which is placed around the lowest rung; the second, a rigid steel rod which is held to the clamp at the right length by the pressure of a thumbscrew. At its lower end this rod terminates in a sharp spike, or in a rubber suction cup. The first is thrust into wooden floors, shingle roofs, etc.; the second is used on cement sidewalks, tin roofs, etc. When not in use, the stay can be pushed to one side of the ladder, and turned through 180°, or until out of the way.

Left: The Ladder "Stay" Pushed to One Side and Folded Out of the Way. Right: Used on Cement Floor with Suction Cup



Sticks of Cordwood Placed on the Lower End of the Table of This Portable Machine are Carried by the Conveyor past the Three Circular Saws to the Top, Where They Fall Off in Four Pieces. Power is Obtained from the Rear Wheel by Means of the Belt and Pulley

TRUCK CARRIES AND DRIVES WOOD-SAWING MACHINE

A portable wood-sawing machine of recent invention is interesting because it cuts each stick into four lengths, and if desired, drops these into the body of a waiting wagon. The table, tilted up in the rear at an angle of about 30°, is fixed to the chassis of a lightweight motor truck, and is slotted for three circular saws. The first of these is placed in the middle at the lower end of the table, the others near the sides at the upper end. All are driven by a belt from a pulley on one of the rear wheels. Power from the same source operates the conveyor chains which, through wooden blocks bolted to them, push the sticks from the lower end of the table, where they have been placed by the operator, to the upper end, where they fall off in four pieces of equal length.

STORELESS MERCHANT MOVES INTO PORTABLE GARAGE

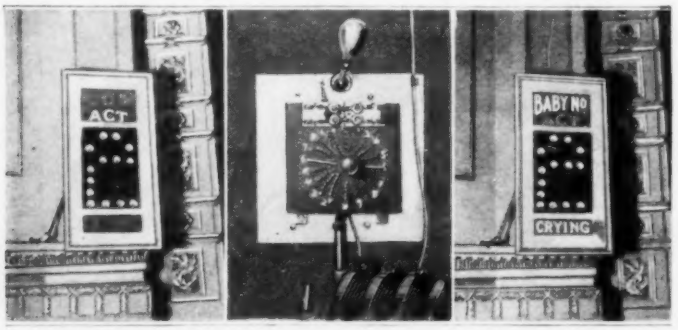
The purchase of a portable metal garage and the temporary rental of a vacant lot recently enabled a fruit dealer of Detroit, Mich., to go into business in an uptown neighborhood despite the prohibitive cost of building and the impossibility of finding a vacant store. The little $350 structure contains a floor space measuring only 12 by 18 ft., yet the dealer has secured plenty of room for his stock by setting his building about 15 ft. distant from the sidewalk. This intervening

The Fruit Dealer Rented a Vacant Lot and Erected This Portable Garage When He Found It Impossible to Build or Rent a Store

area he has covered with planks, and lined, on either side, with tables for the display of his choicer wares.

THEATER NURSERY HAS SIGNAL FOR CALLING MOTHERS

Mothers attending a certain Los Angeles theater may now leave their babies



Left: The Electric-Signboard Act Announcer, in Its Conventional Aspect. Right: The Signboard Converted, by a Switch in the Theater Nursery, into an Indicator That Tells a Mother in the Audience Her Baby is Crying. Center: The Switch That Changes the Sign

in a special nursery, with the assurance that they will be given a silent signal if the little ones become unruly. The same electric signboard alongside the stage that announces the number of each act, functions also as the mother call. Two switches at the top of a panel in the nursery permit the word "Act" on the sign to be changed to the illuminated phrase, "Baby No. — crying." A circular switch lights up the sign lamps to form any desired number, and by that previously assigned symbol calls the mother.

BLIMP WATCHING YACHT RACE FALLS INTO JAMAICA BAY

The group of newspaper reporters who watched the first two of the recent international yacht races from the car of the navy dirigible "C-10" returned from the third race with far less to tell of the contest than of their own experience. The blimp had descended close to the "Shamrock" and "Resolute" as they jockeyed for the start, and had then nosed upward as the radio operator telephoned to New York that the yachts were over the line. To the surprise of the crew the bag climbed sluggishly. Yet 3,000 ft. was reached. Here the nose sagged downward, and the blimp began to fall. First slowly; then, though the crew threw overboard sand, loose equipment, and finally the storage batteries, faster and faster. But the commander kept his head, and sped up the engines in an attempt to reach the nearest shore before all buoyancy was gone. In this he was successful. The car came to rest upon the water, and the half-emptied bag toppled over on its side within a few yards of an old wharf. Salvaged, the blimp is now being repaired.

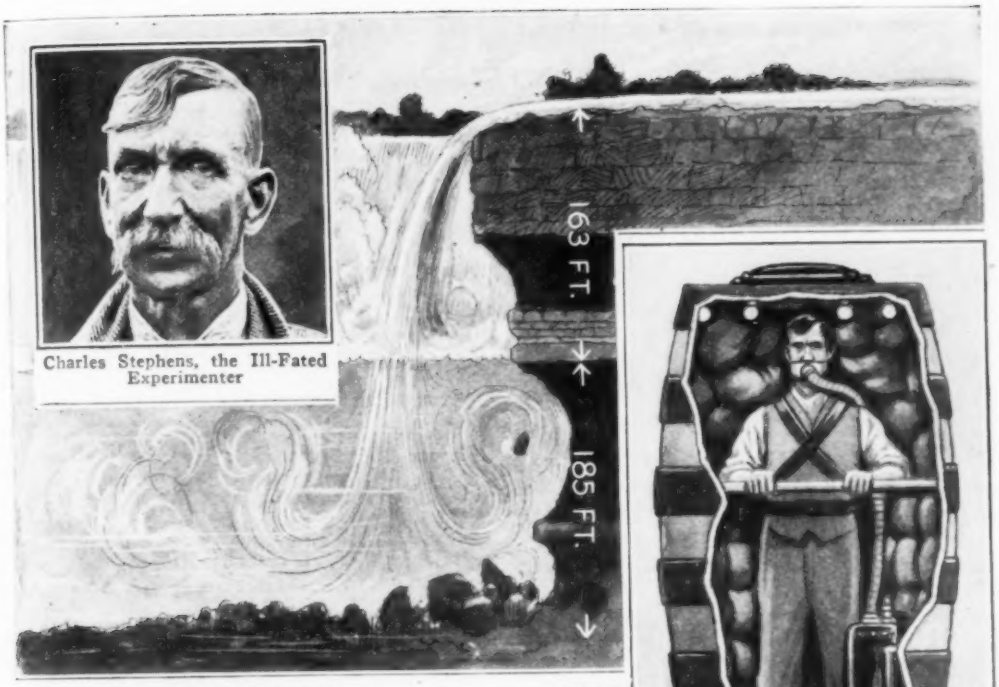
NIAGARA PLUNGE DESTROYS MAN AND BARREL

Incased in stout oak staves, hooped with heavy steel, and seemingly prepared to meet a cataclysm, a misguided adventurer from England on July 11 defied the resistless power of Niagara, and was utterly annihilated. The unfortunate experimenter, convinced that the terrifying plunge of 163 ft. over the falls could be made in safety with the proper mechanical protection, had constructed a barrel for the journey remarkably complete in its equipment. It was 7 ft. long, built of 2-in. oak, and bound with six 6-in. bands of steel. Inside it was padded from end to end. Electric lights and an oxygen-breathing apparatus provided for the occupant's comfort, and at the bottom was a 150-lb. weight to keep it upright.

Stout as this shell appeared, the man who successfully took the plunge in 1911, an interested spectator of the preparations, gave warning that it was not adequate, and motion-picture operators who were present to film the event endeavored to discourage its performance. But the eager traveler was not to be deterred. At 8:30 a. m. he entered his cask, and was towed into the river a mile above the falls by a motorboat, which itself narrowly escaped the pull of the treacherous current. Irrevocably in the rapids, the barrel, despite its bottom weight, turned end over end, swept in an erratic course to the brink, and leaped, bottom up, over the dizzy precipice.

It was 2 p. m., more than five hours later, before the awed spectators espied, floating in the lower river, a single stave from the vanished barrel. After careful search, a man's shoe was found, and then fragments of clothing — nothing more. The eddying pool behind the curtain of the falls is nearly 200 ft. deep in its basin of jagged rock, and there is no way of discovering what its dark hollows may hold.

Charles Stephens, the Ill-Fated Experimenter



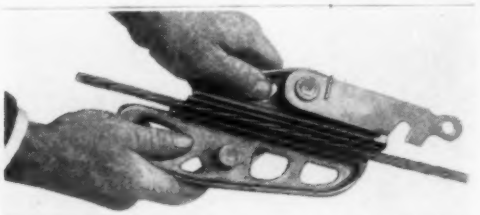
Diagrammatic View of the Steel-Bound Oak Cask, Showing the Padded Interior, the Electric Lights at the Top, and the Special Oxygen-Breathing Apparatus: The Bottom was Weighted to Hold It Upright

Top: A Cross-Sectional Diagram of Niagara Falls, Showing How the Barrel with Its Human Cargo was Whirled into the Deep, Rock-Bound Pool Below. Bottom: The Line Indicates the Erratic Course of the Floating Cask, from the Point Where It was Towed into the Current of the Upper Rapids, to the Brink of the Giant Cascade, Where It and Its Rash Occupant Vanished Forever

The Motorboat Towing the Barrel, with Its Occupant Sealed Within, to the Edge of the Treacherous Current Leading to the Upper Rapids

WIRE CLAMP HAS TENACIOUS BUT HARMLESS GRIP

A wire-pulling clamp now made for the use of electrical linemen, and other workers, is composed of only four simple parts,

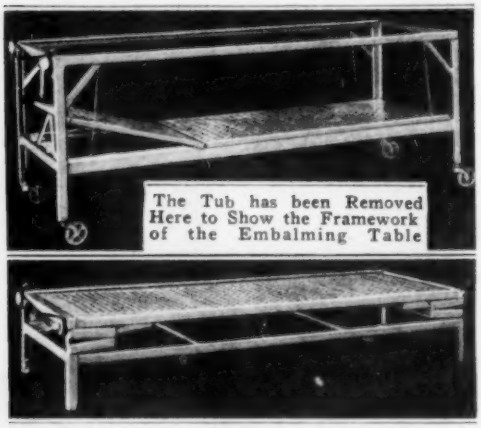


By Means of This Simple Clamp a Pull of a Ton and a Half can be Applied without Injury to the Wire

but has so firm a grip that a 3,000-lb. pull can be exerted. A second model, weighing a few pounds more than the first, will stand a strain of 5,000 lb. Yet neither clamp bends or mars the wire, whether it be bare or insulated. Both clamps can be applied and removed in an instant and cannot drop off the wire accidentally.

EMBALMING APPARATUS FITTED FOR HOSPITAL USE

Description of a newly invented embalming table and bathtub shows it to be singularly adapted to hospital use. It consists of a collapsible steel table frame which, when set up, measures 6 ft. 6 in. long and 2 ft. 4 in. wide. From the four topmost horizontal members of the frame



When in Use Neither as an Embalming Table nor as a Bathing Mechanism, the Apparatus can be Collapsed as Shown

is suspended a tub of metal or, preferably, of rubber. Immediately beneath the two longitudinal members are two long shafts, which are revolved by means of a crank, chain, and sprockets. Cables wound on these shafts support a perforated table top. From these details it is obvious that the table may conveniently be used for bathing hospital patients. Rolled upon the perforated top, from his bed, the patient is lowered into the tub by a few turns of the crank.

CORRECTNESS OF OHM'S LAW RECENTLY VERIFIED

One of the simplest and most important laws used in the theory of electricity and in its everyday applications, is Ohm's law. This law states, practically, that the resistance of a metallic conductor, at any given temperature, is constant. That is, it is independent of the amount of current flowing. This is an experimental law. It was not derived from theoretical considerations. It is, however, of fundamental importance both practically and theoretically. Any slight failure of the law to hold would be of interest to everybody engaged in electrical work.

At the Washington meeting of the American Physical Society, a paper was presented on this subject. Facilities now available for testing the validity of the law are quite superior to those available about 50 years ago, when the matter was previously investigated. It appears that Ohm's law holds exactly as far as the use of modern instruments and methods can determine. It holds to an accuracy of at least three parts in ten million.

NEW AIR-CRAFT CARRIER ADDED TO BRITISH FLEET

The "Ugly Duckling of the British Fleet," known officially as H. M. S. "Eagle," recently was put in service as one of the first vessels to be designed solely for the mothering of naval airplanes. It follows that the accommodations are far superior to those provided by the remodeled cruisers and merchantmen of the past. The landing "field," or level expanse of the superstructure, stretches from bow to stern, and is broken only by the emergence of the funnels and wheelhouse. These are placed well to starboard of the center line. Beneath this long surface are the "hangars," the workshops, and the supply rooms. It is apparent that the nickname "Ugly Duckling," is well deserved. Yet, in spite of its clumsy, unnautical appearance, and its displacement of 30,000 tons, the "Eagle"

WIDE WORLD PHOTO
The New Airplane Carrier "Eagle," Dubbed the "Ugly Duckling of the British Fleet," was Recently Put through Its Trials. It Showed Itself as Swift as the Fastest Cruisers of the Fighting Fleet

is reputed to be as swift as the battle cruisers. This apparent excess of speed is demanded by British naval strategists, who insist that the air-craft carrier be able to maneuver as a vital part of the fighting fleet at all speeds.

SHOTGUN AIDS CAMERA TO SNAP MOVING OBJECTS

Using a shotgun instead of a tripod as a support for his camera, a photographer of southern California has evolved a new method of taking rapidly moving objects, obtaining clear-cut pictures of autos going over 100 miles an hour, during a recent racing meet. The camera, of ordinary type, is rigidly clamped to the gun barrel, and a cord run from its shutter release to the trigger guard. This arrangement enables the photographer to follow the flying cars with his sights, as a gunner follows a bird in the air, and permits an exposure of 1/50 to 1/25 of a second, instead of 1/500 or 1/1,000 as usually employed for such work. Moving the camera with the object blurs the background, but keeps the

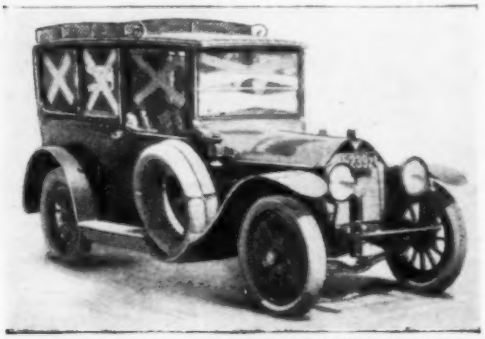
Autos Running More Than 100 Miles an Hour Taken with the Shotgun Camera: The Blurred Background Adds to the Effect of Speed

The Camera, Rigidly Attached to the Gun Barrel, is Snapped by Means of the Cord Running from Its Shutter to the Trigger Guard

main image sharp and clear, a result which actually adds to the effectiveness of the picture by giving visual evidence of rapid motion. It is obvious that the same simple process may be applied to photographing any object whose motion is too swift to be "stopped" by a stationary camera, particularly for nature study, athletic events, and diving feats.

PAPER STRIPS ON AUTOMOBILE WINDOWS REDUCE BREAKAGE

A firm in New York City which makes a business of crating automobiles for export has developed a novel method of



COPYRIGHT, PUBLISHERS' PHOTO SERVICE

Strips of White Paper are Pasted on Windows and Windshield Before the Car is Crated for Shipment

reducing breakage, en route, of windshields and closed-car windows. On each pane are pasted crosswise two strips of heavy white paper. The object is not to dampen vibration, as in the case of similar treatment of Parisian shop windows during the war, but rather to make the windows visible in a dimly lighted shop interior or ship's hold. Tools and even heads were frequently thrust through the panes by careless workmen before this expedient was resorted to.

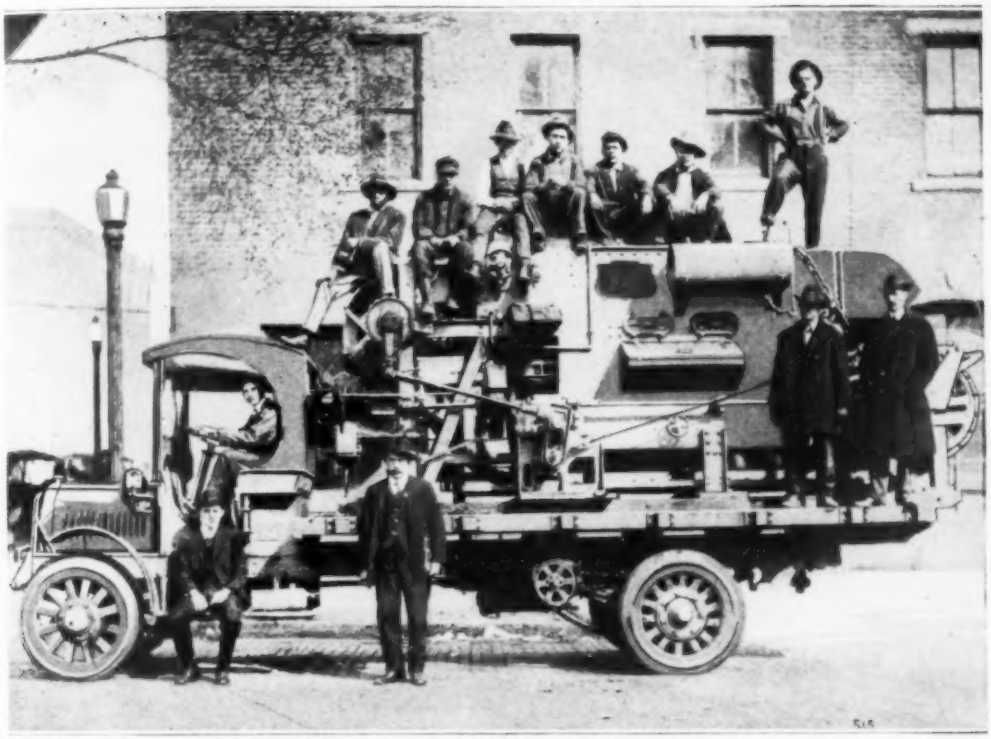
TREES IN DYNAMITED SOIL YIELD FIVE TIMES NORMAL

For exploiting the agricultural use of dynamite most publicity has been given in the past to the various state experiment stations. It is now learned, however, that a private farm near Spartanburg, S. C., has been worked largely by means of explosives for the last eight years. Results were slow to show themselves, at first; but now the system is netting the farmer, in fruit at least, an increase over normal of approximately 400 per cent. In one section of the fruit orchard, that is, where the seedlings were set alternately in spade-dug holes, and in dynamite craters, the trees in the latter now yield an average of five times the crop of their neighbors. Cotton and corn have also been grown on dynamited ground with similar, though less startling results.

CANTONMENT HUTS AUCTIONED TO RELIEVE HOUSE SHORTAGE

Approximately 150 squad huts were auctioned off by the War Department at Camp Dodge, Ia., recently, to relieve the housing shortage in and about Des Moines. Most of the buyers carried their purchases away bodily, by motor truck; and all, from those who paid $75 to those who paid $125, seemed more than satisfied with their bargains. The little dwellings have never been occupied, indeed, as they were completed at about the time of the armistice. Each measures 20 by 20 ft., and is sided with one-foot boards. Between these and the wallboard of the interior are sheets of composition roofing similar to those on the roof. Each room is wainscoted with pine to a height of four feet.

Approximately 150 Squad Huts were Auctioned Off at Camp Dodge, Iowa, Recently in the Course of Spirited Bidding at the Auction Pictured Above. For $75 to $125 the Purchaser Acquired a Little Dwelling Identical with That at the Left. The Foundation Measures 20 by 20 Feet



A Motor Truck of 3½ Tons' Rated Capacity, Carrying a Bottling Machine Weighing 41,200 Pounds, or an Overload of 488½ Per Cent: The Big Load was Hauled Two Miles without Trouble

MANY TIMES ITS RATED LOAD CARRIED BY MOTOR TRUCK

Instances of the successful transportation of extraordinary loads by motor trucks are not uncommon, but usually the trucks employed are of great capacity or are assisted by trailers. In West Virginia recently a huge bottling machine, weighing 41,200 lb., had to be carried from the railroad station to a factory two miles distant, and no special equipment was available. The feat finally was accomplished by an ordinary 3½-ton truck, with four years of service behind it. In spite of the fact that the load was about 17 tons more than the truck's rated capacity, representing an overload of 488½ per cent, no trouble was encountered on the remarkable trip.

BOTTLE CAPPER FOR HOME USE RESEMBLES PAIR OF PLIERS

A bottle capper of recent invention will find favor with housewives because it operates on a beverage bottle of any type and size, and because it is hardly larger than a pair of pliers. Superficially, it resembles this tool, though on closer inspection it is seen that the jaws are prolonged as lazy tongs, on the end of which is a metal cup. Beyond this cup is fixed rigidly a yoke, or collar. To employ the instrument, a metal cap of the usual kind is placed in the bottom of the cup; then

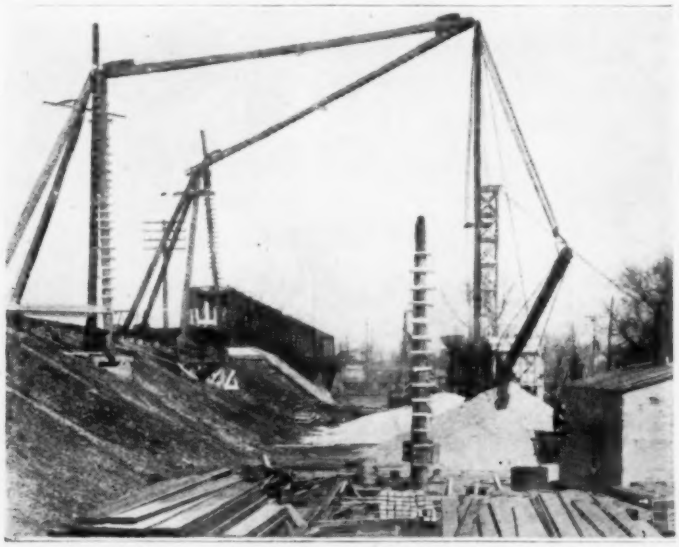
Though Hardly Larger than a Pair of Pliers, the Little Instrument will Cap a Beverage Bottle of Any Style and Size. Various Phases of Its Operation are Pictured Here

the cup is inverted over the mouth of the bottle, and the yoke is locked around the neck. As the handles are squeezed, the cap is pressed into place.

A FOUR-TRACK CONCRETE RAILROAD BRIDGE

By STANLEY W. TODD

BY the construction of a four-track railroad bridge of unusual design over the Kankakee River, at Kankakee, Ill., a serious congestion of the freight business between Chicago and New Orleans has been relieved. The bridge, which is 62 ft. wide and 626 ft. long, is capable of handling four long trains at once, furnishing sufficient facilities at this point to meet the situation for some time to come. The structure is on the main line of the Illinois Central Railroad.

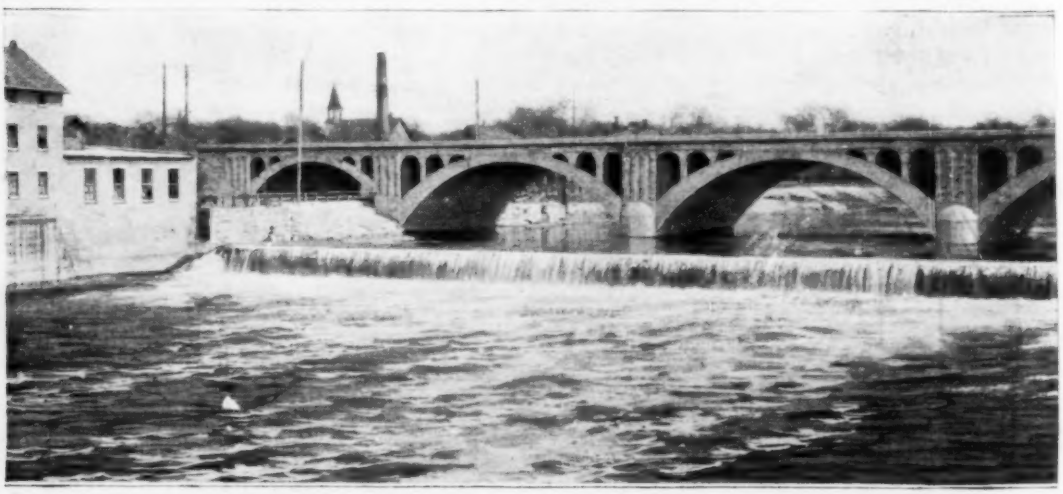


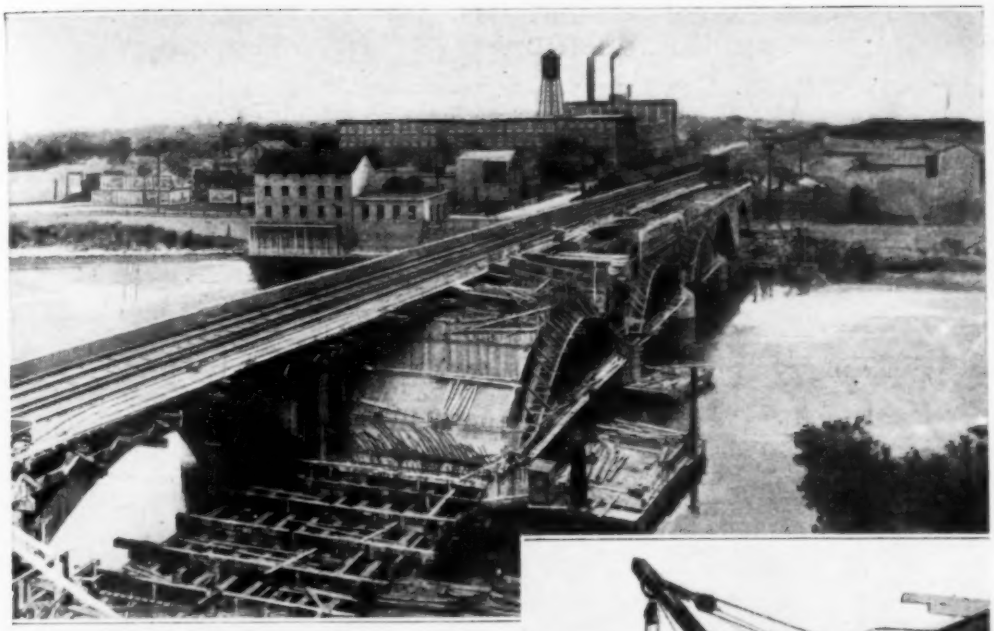
As Property Owners would Not Let the Railroad Engineers Use the Ordinary Cables for the Purpose, the Concreting Materials had to be Handled with the Stiff-Leg Derrick Pictured Here

The new bridge is of the open-arch type, with five arches of 90-ft. span, a 23-ft. rise over the river, and one arch of smaller dimensions over a street-car line. The arches are segments of a true circle. Taking the place of an old two-track truss bridge, that had stood for 34 years, the new structure has been in course of construction about three years. The grade of the tracks had to be raised 3 ft. to give the arches their proper shape.

The engineering problems involved in building the bridge were many. One of the features was the use of a stiff-leg derrick, for handling the concreting materials, because property owners would not let the railroad engineers use the ordinary cables for the purpose. It was found that the bed of the river was solid rock, so that not much excavating was needed or undertaken. The pier foundations were placed after the base rock had been blasted out to a depth of 2 ft. for a distance of 80 ft., 16 ft. wide.

Over this bridge, when officially opened, there will be one set of tracks for the handling of interchange freight between



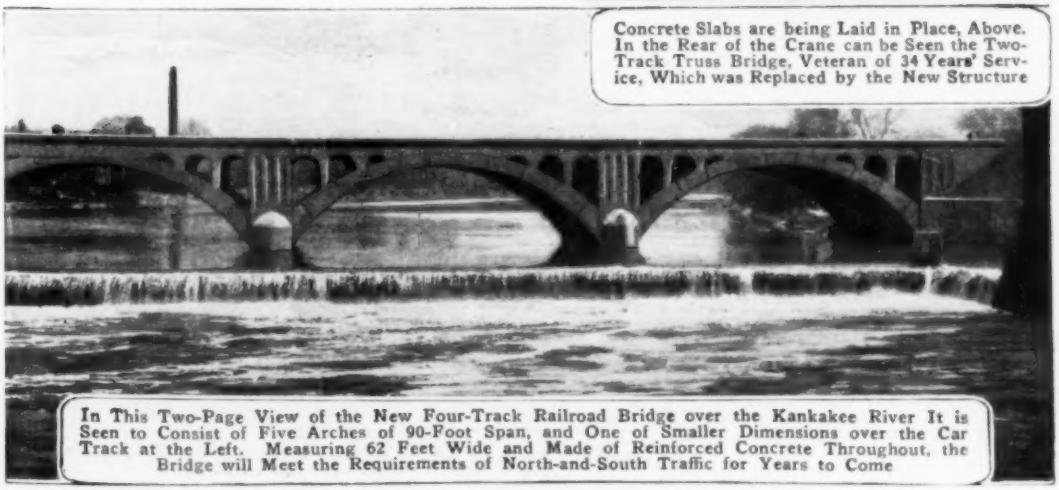


Nearly Every Phase of the Construction Work is Illustrated by This Photograph. Little Preliminary Excavation had to be Done as the Bed of the River at This Place is Formed of Solid Rock. A Bare Two Feet of This was Blasted Away Before the Foundations were Laid

two of the big railroad systems; the other tracks will be used for passenger trains.

¶An American insurance firm, following the lead of a famous British company, is now covering weather risks not only for proprietors of open-air resorts, managers of tennis tournaments, etc., but even for individuals leaving the city for a day's holiday.

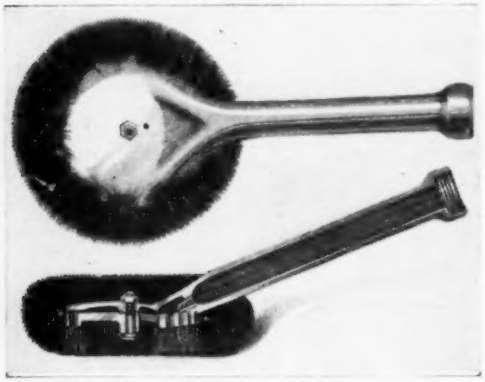
Concrete Slabs are being Laid in Place, Above. In the Rear of the Crane can be Seen the Two-Track Truss Bridge, Veteran of 34 Years' Service, Which was Replaced by the New Structure



In This Two-Page View of the New Four-Track Railroad Bridge over the Kankakee River It is Seen to Consist of Five Arches of 90-Foot Span, and One of Smaller Dimensions over the Car Track at the Left. Measuring 62 Feet Wide and Made of Reinforced Concrete Throughout, the Bridge will Meet the Requirements of North-and-South Traffic for Years to Come

AUTOMOBILE-WASHING BRUSH WHIRLED BY MIDGET TURBINE

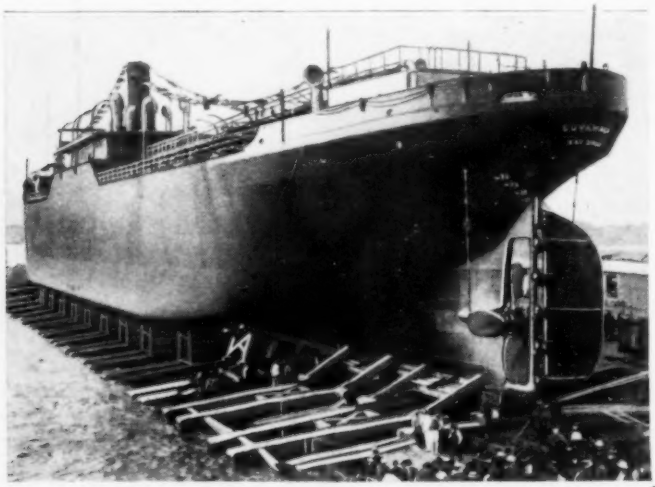
The hydraulic turbine, commonly thought of as a colossal mechanism at the foot of some great waterfall, is now used in Lilliputian form in a newly invented brush for washing automobiles. The instrument is screwed to the end of an ordinary garden hose by means of a hollow nozzle handle which flattens out at its working end into a metal disk. To this circumference is attached a circular brush of horsehair. Beneath the disk, and impelled by the jet from the handle, is the midget turbine. As the impeller of the little mechanism revolves, it gives a whirling motion to a second, smaller circlet of bristles, and so makes easy the removal of the most adhesive mud.

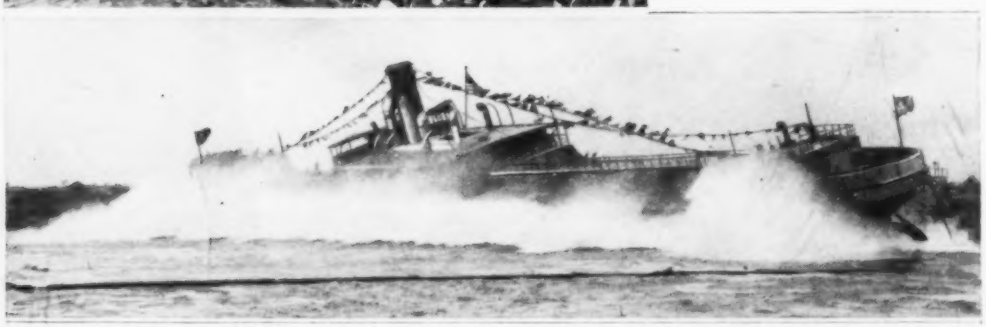


The Implement is Shown in Top and Sectional View. In the Latter are Seen the Turbine and the Second Smaller Brush

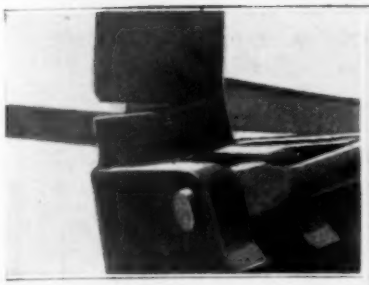
CONCRETE OIL SHIP LAUNCHED WITH MACHINERY INSTALLED

The last word both in ships and in methods of launching them was presented in San Diego Bay, Calif., recently when the 7,500-ton concrete oil-tank steamer "Cuyamaca" took the water. In the new boat, which is 434 ft. long, all the engineering learned in previous building of concrete ships was applied, and the result is expected to justify all the claims ever made for the "rock" construction. The remarkable feature of the launching was the installation of all the ship's machinery prior to the event, leaving little in the way of outfitting to be done after it was afloat. The vessel was launched sideways, and to assure an even keel in striking the water, and avoid all strain, releasing triggers on the ways fore and aft were arranged for simultaneous action, resulting in an unusually even and accurately timed contact of the hull with the water.





Above: The Concrete Oil-Tank Steamer on the Ways Ready for Launching with Machinery Installed, Showing One Set of Release Triggers. Bottom: The Vessel Launched Sideways on an Even Keel by the Simultaneous Release of Triggers at Both Ends



Above Is a Close View of the Break in One of the Five Cast-Iron Columns That Support the Lighthouse. All Five were Bent and Broken in the Same Way

One of the Five Columns is Seen Above on the Completion of the Welding. Though Crooked, as Before, It Is Now Amply Strong

Hidden by the Numerous Temporary Wooden Piles the Cast-Iron Columns Are Indistinguishable in the General View of the Lighthouse, at the Left. The Interesting Picture at the Right was Obtained as the Liquid Steel was Pouring from the Crucible into the Molds Surrounding One of the Breaks

LIGHTHOUSE SUPPORTS WELDED WITHOUT STRAIGHTENING

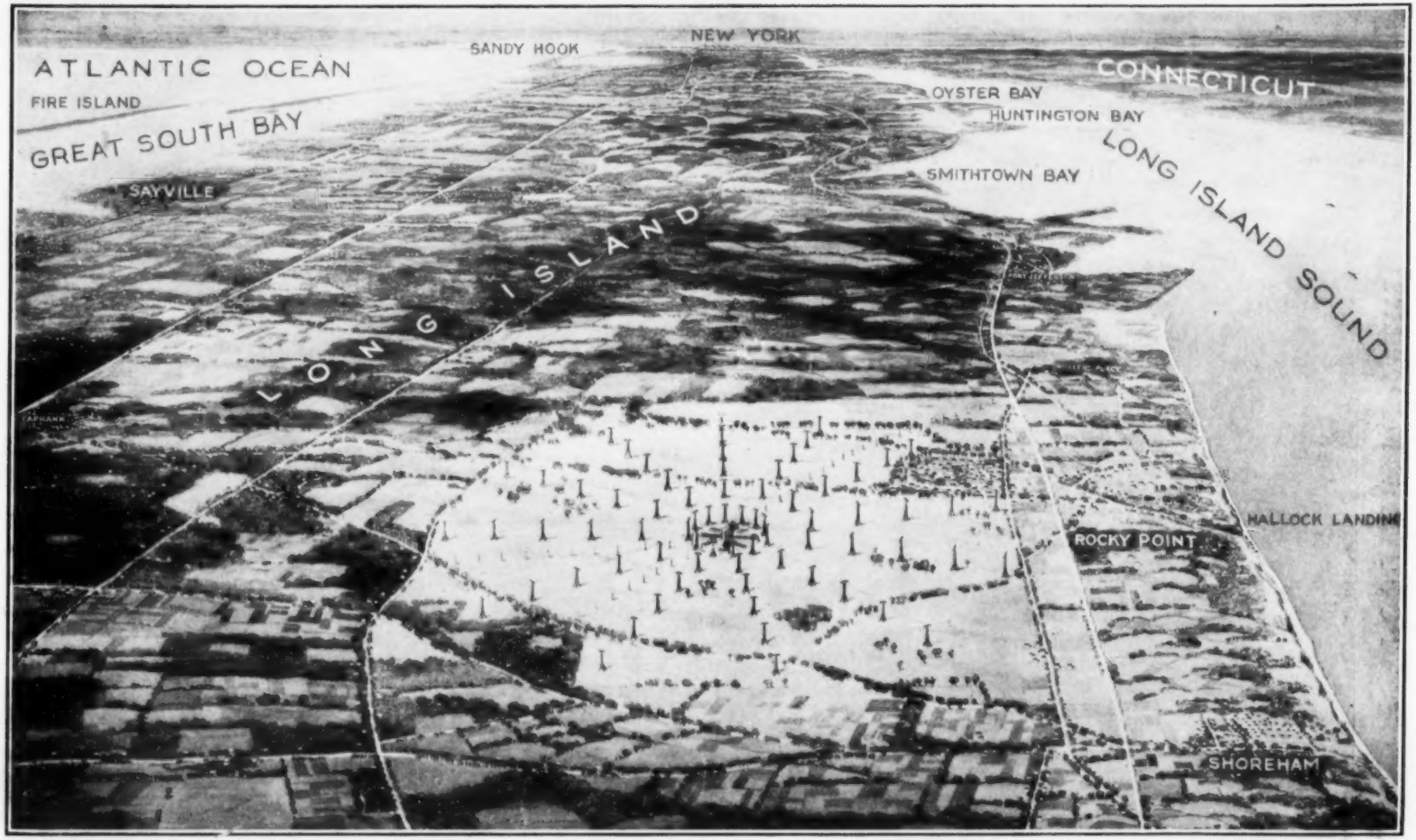
Rather than spend $13,000 for new columns, or $30,000 for a new structure, the Federal lighthouse service recently repaired the five cast-iron supports of a South Carolina lighthouse, bent and broken in an ice jam, by the simple expedient of welding the parts together. No attempt was made to straighten them. As these supporting columns had been bent equally, it must be explained, the lighthouse itself had not left the vertical and was still held firmly in place by the various tie-rods.

The columns were welded one at a time, a 50-ton ratchet jack being used to lift the weight off each in turn. Each break was then made complete, and so widened for the weld, by cutting away the parts in contact. The interior of the column was next filled with molding sand, and a second mold was built around the exterior. The thermite crucible was then placed on a wooden staging beside the break, while sheets of asbestos were nailed over all exposed wooden parts. The ends of the broken parts were now heated to red heat, the crucible priming was touched off, and the liquid steel, at 5,000° F., was run into the molds. In spite of the intense heat the lighthouse was not injured, and on completion of the job it was found that the columns, though crooked as ever, were now amply strong.

GOLD PRODUCTION OF WORLD IN 1919 AND 1920

Between $345,000,000 and $350,000,000 is the value of all the gold produced in the world during 1919, according to the latest available figures, as compared with $380,924,500 for 1918. The uncertainty in the reports just completed is due to the lack of information from Russia. The United States' share in the 1919 output was $58,285,196, but present reports indicate that the 1920 yield will not exceed $50,000,000. Canada's 1919 contribution was $14,687,000, the Transvaal's $171,640,173, India's $10,028,000, and Australia's $29,268,000, while $18,631,070 came from Rhodesia and West Africa.

¶A group of returned soldiers on the west coast of Vancouver Island, B. C., are bottling salmon on a commercial scale. The salmon are put up in glass jars.



An Aerial View of Long Island, Looking West, with the Site of the New Giant Radio Station in the Foreground: There Are 72 Antenna Towers in the Rows That Radiate from a Common Center like the Spokes of a Wheel. Six Towers in Each Spoke or 12 in Each Complete Row. The Towers, Small as They Appear, Are 400 Feet High, and Carry Crossarms 150 Feet Long. One Row is to be Reserved for Emergency, the Other Five being Used Simultaneously as Independent Transmitting Aerials

ENORMOUS STATION TO BE WORLD'S RADIO CENTER

A new commercial radio station, so enormous that any one of its six complete transmitting equipments will equal the world's greatest existing stations, is about to be constructed on Long Island, N. Y. A tract of 6,400 acres, practically 10 square miles, will be covered by the 72 huge steel antenna towers, which, in six lines of 12 each, will cross each other like the spokes of a giant wheel. The towers, 400 ft. high, carry crossarms, 150 ft. long, for the wires. Five of these great lines of antenna will be used for regular service, reserving the sixth for emergency. For special signaling, all five may be combined into one vast aerial of unprecedented capacity, or each may be split into two shorter aerials, giving a total of ten. All will be used simultaneously, communicating directly with all European countries, and ultimately with every station in the world.

Sending current is to be supplied by a total of ten 200-kw. high-frequency generators, two for each transmitter. Multiple tuning of the antennæ will add greatly to the sending effectiveness, giving results formerly attained, it is declared, only with five times the power. All this powerful transmitting equipment will be actuated by remote control from the office in New York City, the five sets of receiving apparatus being located but 18 miles from the sending station. The receiving antennæ are to be arranged for the entire elimination of static trouble, and received messages from all parts of the world will be handled like ordinary telegrams, and delivered to their recipients by messenger boys. Ultimately it is the intention to install automatic high-speed transmitters and receivers, giving the new station a tremendous message capacity.

SAWDUST YIELDS GLUCOSE IN LABORATORY TESTS

The commercial production of glucose from sawdust may soon be a fact, it is believed, as a result of experiments performed recently at the New York State College of Forestry. This laboratory work involved the acid treatment of various kinds of sawdust with sugar as the final product. This sugar is not, of course, the familiar sucrose, or cane sugar, of the table, but is glucose, so widely used as a nutritive component of sirups and the like. Sucrose cannot now be produced from glucose commercially or in the laboratory; and there is little prospect that such a synthesis will ever be accomplished. Yet this latest work promises to open the way to a valuable and previously unsuspected source of food supply.

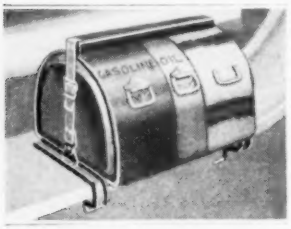
PAPEETE HARBOR ENTERTAINS ITS SMALLEST GUEST

As all travelers pass some time or other through Paris, so it might be said that all globe-wandering ships put in, sooner or later, at the Society Islands. Not long after the U. S. battleship "South Dakota" paid its recent visit to the French possessions in the South Pacific, the largest vessel that ever entered Papeete harbor, a claimant for the complementary honor appeared. The sloop yacht "Ogre," a mere toy of 11 tons, carrying five passengers, arrived at Tahiti some nine months after leaving London, on its leisurely way around the world. After a short stay the little boat sailed for New Zealand on the last lap of its 30,000-mile cruise.

The Sloop Yacht "Ogre," of 11 Tons, at Anchor in Papeete Harbor, on Its Year's Cruise around the World

AUTO CANTEENS CARRY EXTRA GASOLINE, OIL, AND WATER

Many careful autoists carry spare parts for possible emergency, but fail to provide against the most probable emergency of all — running out of fuel, oil, or water. A western manufacturer is undertaking to remedy this oversight by supplying a set of three canteenlike containers that rest compactly on the running board. A steel channel across the top covers the caps, and is strapped to two clamps. The 2-gal. gasoline can is red, the 1-gal. oilcan is blue, and the 2-gal. water tank is covered with blanket material.



COLLEGE TEACHES CHILD CARE WITH REAL LIVE BABY

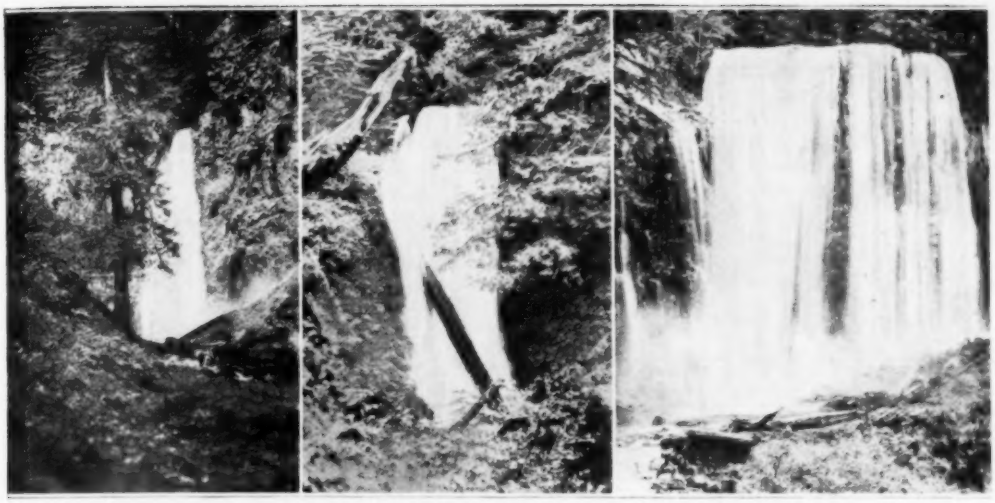
Child care is obviously the most important of all domestic-science subjects, but the one most conspicuous by its absence from college curriculums, because of the difficulty of maintaining an experimental baby as a part of the laboratory equipment. But even this seemingly insurmountable obstacle has been overcome by an agricultural school in the far West, where a real and very live baby girl is actually installed for class study. Six girl students take care of the little subject, each having a week's turn. Next year another baby will be "adopted."

ALL-METAL MONOPLANE MAKES 1,400-MILE NONSTOP FLIGHT

One of the all-metal passenger-carrying monoplanes which by their distance and altitude flights along the Atlantic coast have been almost monopolizing the interest of airmen during the last few months, recently outdid even these performances by flying in 10 hours and 58 minutes, and without a stop, from Omaha, Neb., to within 40 miles of Philadelphia, Pa. The approach of dusk compelled a halt before the goal, New York City, was reached, yet the 1,400-mile flight is the longest ever made in America.

This airplane, like the others now being manufactured and sold by the owner of the American rights, is the creation of a celebrated Dutch designer, and is formed almost entirely of an aluminum alloy. Consequently it appeals to the commercial operator as being fireproof, weatherproof, and comparatively indestructible. The two wings, being cantilever, internally braced structures, are devoid of struts and wires, and thus offer a minimum of resistance to the air. It is for this as much as for any other reason that the plane is able to carry six to eight persons at an average speed of 112 miles an hour though powered with an engine of only 160 horsepower.

It Was a Monoplane of This All-Metal Type That Recently Flew in 10 Hours and 58 Minutes, and without a Stop, from Omaha, Nebraska, to within 40 Miles of Philadelphia. Though Powered with an Engine of Only 160 Horsepower, the Plane Carries Six to Eight Persons at 112 Miles an Hour



These Three Waterfalls, Totaling 450 Feet in Height, were Recently Discovered Not More than 40 Miles from Portland, Oregon. Proceeding Upstream, the Discoverers Came upon Them in the Order of Their Arrangement Above. The First, at the Left, Is 175 Feet High; the Second, Just a Few Yards Farther On, Is Approximately the Same; the Third, a Quarter of a Mile Upstream, Is 100 Feet High

WATERFALLS NEAR BIG CITY JUST DISCOVERED

BY HORACE E. THOMAS

WATERFALLS that rival in beauty the most splendid cataracts of the Pacific Northwest have just been discovered on the western slope of the Cascade Mountains in Oregon. Although within 40 miles of Portland, a city of 260,000 people, no white man, so far as the records show, had ever seen them until a few weeks ago. If a man with a spyglass were stationed at a vantage point near the falls, he could distinguish a score of towns and cities, could see the smoke of industries and ocean vessels plying the Willamette River, could discern railroad and electric trains, and the other earmarks of civilization; yet, for generations, the falls have been unknown to the people living almost within hearing of their pounding waters.

The falls lie almost in the center of the Bull Run Forest Reserve, set aside by the government to protect Bull Run Lake and Bull Run River, the sources of Portland's water supply. It is this, of course, that accounts for the fact that the falls were not discovered long ago. The reserve is closed to all visitors except employes of the government and of the city of Portland who may go there on business, a precaution taken to protect the timber of the watershed against fires that might be started by careless campers. Every trail that leads into the reserve is carefully guarded, and the public is excluded at all times.

The reserve, which includes 222 square miles of mountains and forest, was set aside by Congress in 1892, and has been closely guarded ever since. It may be that in the early days some of the men who inspected the reserve came upon the falls, but this is unlikely, as they could hardly have failed to make a record of their discovery. The geological service made a survey of the district, but the falls do not show on their maps, although all other waterfalls are marked. None of the officials or employes of the water bureau of Portland, who have supervision of the reserve jointly with the United States Forest Service, knew that the falls existed.

The falls were found by three officials of the water bureau who had been traveling a new trail that leads from Bull Run Lake to the headworks of the water system, a distance of 21 miles. Up to the present time, the only trails between these places led along the mountain ridge, above Bull Run River. They decided to explore Falls Creek, a tributary of the Bull Run, which had been named for minor falls that were already well known. Penetrating with great difficulty up this stream, they came into a deep box cañon, and abruptly rounding a turn, were in full view of the lower of the unknown falls. They found that the stream at this place drops over a series of three shelves, two close together, and the other a quarter of a mile above them.

The enthusiastic description of the beauty of the falls brought back by the

party was later confirmed by photographs. The new falls are compared in beauty with Multnomah, most famous of Oregon's waterfalls. Multnomah is higher, having a drop of 610 ft., while the Falls Creek cataracts have a combined elevation of 450 ft. Falls Creek, however, has a larger flow of water. In early summer, a large body of water flows down Falls Creek and the cataracts are extremely beautiful. Later in the season the stream is greatly diminished.

A peculiar circumstance is that surveying parties are known to have gone within 400 or 500 yards of the falls without finding them. Even now that they are found, however, their beauty will continue to be wasted, as the exclusion of the public from the reserve is a policy that probably never will be changed.

LIBRARY CAR CARRIES BOOKS TO FARMERS NEAR CITY

Since the purchase, by the city library board, of a small automobile now known locally as the "Book Wagon," farming families living near Portland, Ore., have been able to enjoy the privileges of the municipal library without stirring farther than their front gates. Each morning the bookshelves in the tonneau are freshly stocked by a young woman who knows from experience what her people want. Then she speeds over the country highways, leaving books as requested, and picking up those left on previous trips. As the various routes are covered on a day-and-hour schedule, the families along the way know when to expect the book wagon, and so are usually ready to return the books on hand and to make their new selections with little delay.

The "Book Wagon" Departs from the Public Library at Portland, Oregon, Every Morning with Books for Families on Farms about the City

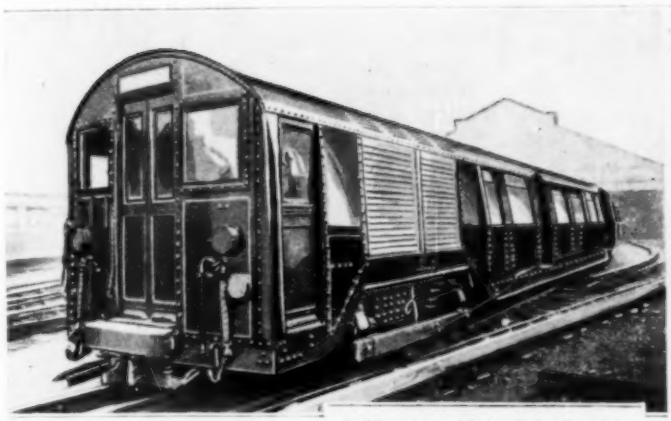
¶What is believed to be the only natural fresh-water lake in Panama was recently discovered accidentally near Ancon by airmen of the Seventh Aero Squadron, U. S. A., during an aerial reconnaissance.

NEW FISHING RULE IN EFFECT FOR YELLOWSTONE PARK

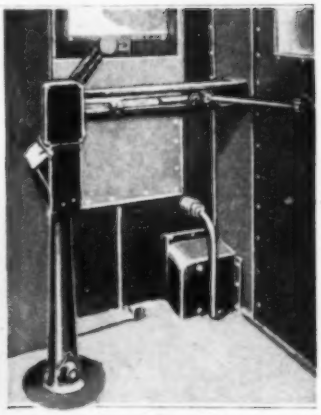
Tourists who plan to wield their fishing rods in Yellowstone National Park this season are advised that, because of the record-breaking number of visitors expected, a new ruling has gone into effect. It prescribes that a visitor can take no more than 10 fish from the streams and lakes within two miles of the main highways. Otherwise, as in the past, tourists are not required to purchase licenses, and are given access to all the fishing areas. Hook and line only are allowed, and all fish under eight inches must be returned to the water unless seriously injured. Fishermen will find additional interest in the news that the Bureau of Fisheries has established a large hatchery at its Yellowstone station, and plans this year to outdo even its activity of 1919, when 700,000 young fish were placed in the various lakes and streams.

ODD NEW ELECTRIC TRAINS RUN IN LONDON TUBES

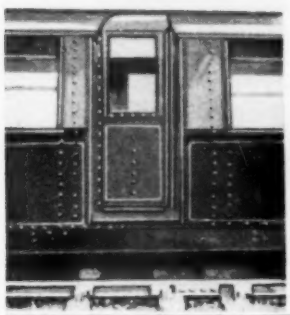
Electric trains made up of six cars, with the first, last, and one of the intermediate coaches motor-driven, and the others trailers, comprise the new equipment of the underground railway in London. Each motor car has two motors of 240 hp., giving a total of 1,440 for the train, and allowing a speed of 48 miles an hour. The motor cars seat 36 passengers, the trailers 48 each, loading and unloading being facilitated by a third door in the center. This auxiliary door is electrically controlled from the end, red

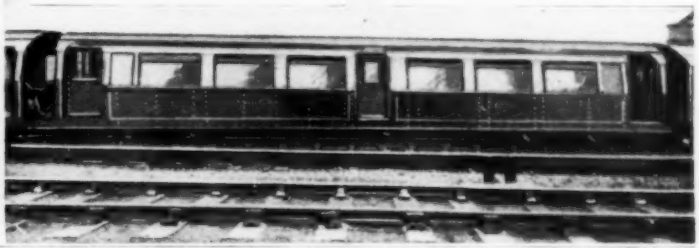


A Motor-Car Unit of the London Underground Railway's New Rolling Stock, Three of Which are Included in Each Six-Car Train



Door-Control Mechanism, Which Automatically Unlocks the Center Door and Lights a Pilot Lamp When the End Doors are Opened





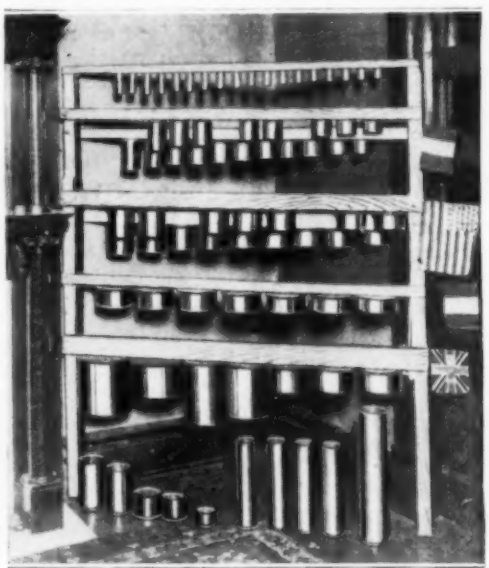
PHOTOS BY COURTESY OF THE ELECTRICAL REVIEW, LONDON

Left: A Detail View of One of the Center Doors, Which are Electrically Controlled from the End, and Swing Instead of Sliding. Right: Side View of One of the Trailer Cars, Showing the Large Windows and the Arrangement of the Doors, Three to a Side

and green pilot lights indicating its locked or unlocked condition. The doors swing instead of sliding, because of the peculiar shape of the cars, to conform to the tube through which they run. In starting, the motorman swings his controller at once to the full running position, a relay automatically taking care of the usual steps of progression. Each car is 50 ft. 10 in. long, and constructed almost entirely of steel.

MUSICAL INSTRUMENT MADE OF SHELLS FROM FRANCE

A musical instrument, as peculiar for its construction as for the origin of its parts, has recently been completed by a clergyman-architect of Columbus, Ohio. During the course of 21 months' Y. M. C. A. service along the western front, this man collected shell cases of almost every caliber used by the allied and German armies. These he has arranged according to diameter, cut to proper length, and suspended from the crossbars of a wooden frame. As a result he has a percussion instrument which yields music not unlike that produced by the old-time bell ringers.



This Musical Instrument is Made of Shells Collected from the Battle Fields of France

ODD MOTORCYCLE RACE HELD ON BOWLDER-STREWN BEACH

A bowlder-studded strip of ocean beach near Santa Monica, Calif., was recently the scene of a motorcycle obstacle race. As it is impossible to find a square yard of beach without its bowlder, the difficulties of the contest can be imagined. Nine riders started upon the 300-yd. course; five finished. The others were spilled ingloriously, or dropped out as their machines were damaged. The winner's time was 3 min. 8 seconds.

Four of the Contestants are Seen Here at the Start of the Race along the Bowlder-Strewn Beach. The Contest Was a Splendid Test of the Riders' Ability

MONUMENT TO COMMEMORATE BRAZILIAN INDEPENDENCE

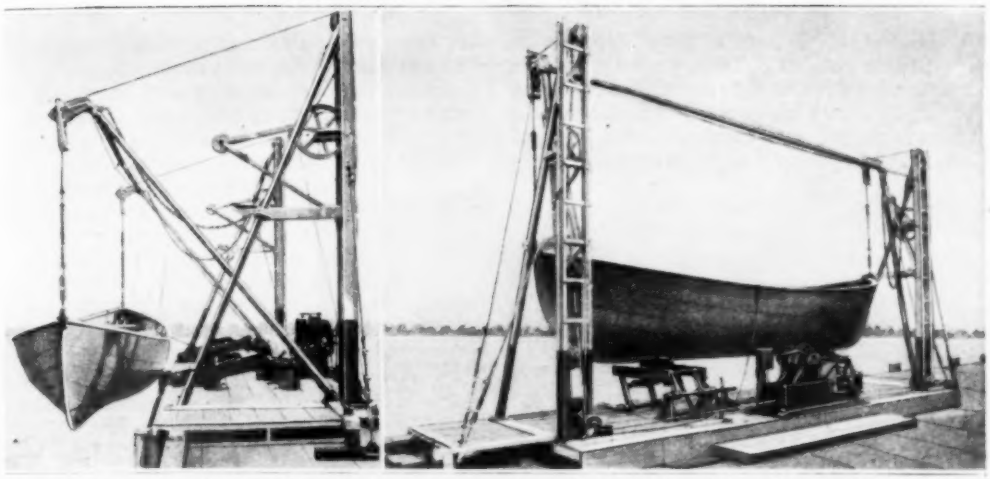
A towering monument of marble is soon to be erected in the city of São Paulo —situated about 220 miles west of Rio de Janeiro—in commemoration of the Brazilian declaration of independence. This declaration was made in São Paulo on Sept. 7, 1822, a few months after the break with Portugal, it may be recalled, by the prince Dom Pedro, later constitutional emperor. Nothing of this history is suggested by the monument, however, as since 1889 Brazil has been a republic. Instead, the work is almost wholly allegorical. The dominating group, consisting of a number of life-size figures about a horse-drawn chariot, is supported by a rectangular pedestal. This is approached by a flight of steps which support a smaller group.

COPYRIGHT, KEYSTONE VIEW CO.

This Monument is Soon to be Erected in the City of São Paulo in Commemoration of the Brazilian Declaration of Independence

BASEBALL AFFECTS DEPORTMENT OF SCHOOL CHILDREN

Ever since 1917, the Salt Lake City baseball club has been casting its bread upon the waters and laying up treasure in heaven in a form of advertising that has returns just as sure and large as they are valuable. When the season opened in April, 1917, the club started inviting the teachers and pupils of the four higher grades to be their guests on every Friday afternoon. Of course, the pupils have to do something to be worthy of this great privilege. Their week's conduct has to be satisfactory to their teachers, satisfactory as to attendance and deportment, and with a grade of 85 in every study. Thus baseball makes what is known to school-teachers as "little angels of good behavior" out of all the boys and girls of these grades, or nearly all. There have to be some black sheep in



The Side View of the New One-Man Davit, at the Left, Shows the Two Pivoted Arms from Which the Boat is Hung. The Boat Rests upon the Two Collapsible Blocks, at the Right. Here are Seen the Two Girder Uprights and, Immediately in Front of the Boat, the Mechanism by Means of Which the Speed of Descent is Controlled

every flock, but they are rare in this flock of school children. The free games are open to about 6,000 children, and out of this number 98 per cent have satisfactory enough conduct to win the privilege. Every Friday these pupils are excused an hour early. Street cars meet them near the schoolhouses, and the boys have seats on the bleachers, while the girls and teachers have their pick of seats on the grand stand. It may be true that there is no royal road to learning, but Salt Lake children know there is at least a royal weekly prize by the wayside.

And baseball not only makes angels out of the school children but fans as well. Here is where the management of the ball team has shown good advertising sense. The fan on Friday wants to be a fan on Saturday, and on all other possible occasions. He is going to talk ball games at home to elder brother and father, and one free ticket to a boy or girl may mean a whole family paying for tickets on another day. It also means that Salt Lake will always be a city of men and women enthusiastic over the national game from generation to generation.

NEWEST LIFEBOAT DAVIT IS OPERATED BY ONE MAN

To the old problem of lowering lifeboats from a ship's deck to the water a new solution has recently been attempted in the form of a one-man davit. The chief merits claimed for the invention are simplicity, speed, and safety of operation. One man can release the lifeboat; then step into it, and, by paying out a single line, lower it into the water at any desired speed. On striking the water, further, the boat is always on even keel. The apparatus by means of which this performance is achieved consists of two girder uprights, to the bases of which are pivoted the arms from which the boat is hung. When not in use, the boat rests upon two "blocks"; when the boat is to be released for use, these are collapsed, so throwing the weight of the boat upon the pivoted arms.

GAUGE ON TIRE-VALVE STEM TELLS PRESSURE WITHIN

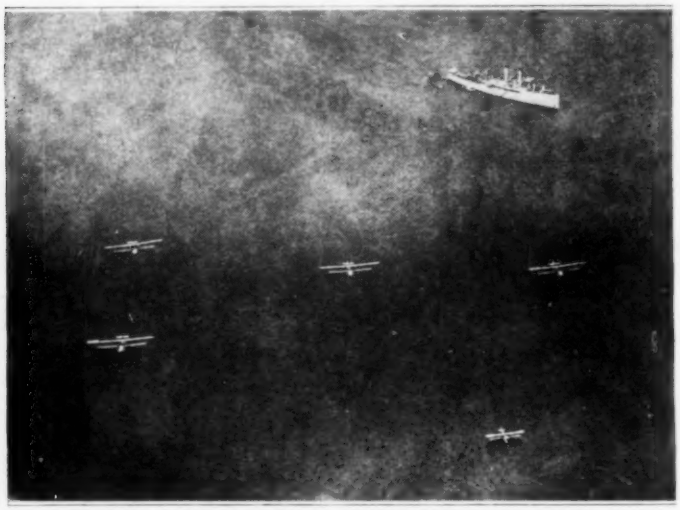
Most autoists carry a tire gauge nowadays, but many postpone using it from day to day because of the bother of removing a dust cap and a valve cap from a tire that "looks all right." The bother is eliminated, and the guessing replaced by accurate and constant information, with the use of a new type of gauge that forms part of the valve stem on each tire, and is working and visible all the time. The indicator is a graduated tube on a coil

A Tire-Valve Stem That Carries Its Own Pressure Gauge, Visible through a Heavy Glass Dust Cap

spring, with an inner valve tube of rubber. The dust cap used with it is made of thick flint glass, tested to stand hard bumps and high pressure.

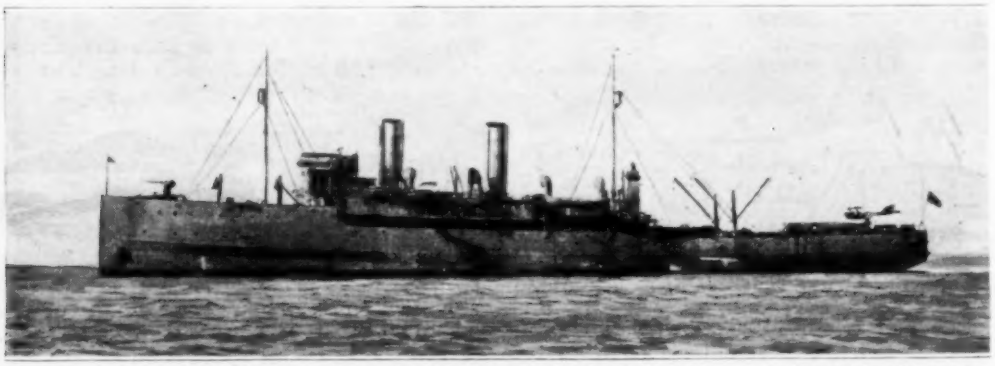
SEAGOING AIR FLEET NOW A PERMANENT PART OF THE U. S. NAVY

A SEAGOING aerial fleet, capable of prolonged and independent service far from land, is now a permanent part of the U. S. Navy as a result of the recent maneuvers off the southeastern tip of Cuba. As organized experimentally, early in the spring of last year, this self-sustaining aerial group, probably the first of its kind in naval history, consisted of three parts. Most important were the six (later five) big flying boats of the twin-motored F-5L type. These relied on their own motive power for transport from station to station, and when not in the air, were anchored in formation like so many surface craft. In addition there were four fast scouting planes of the float-equipped airplane type; and third, the U. S. S. "Shawmont," formerly a mine layer, which served as mother ship to the nine air craft. On board the "Shawmont" are workshops, fuel tanks, storerooms for spare parts, and living quarters for airmen and mechanics. The after deck is cleared for the accommodation of the small scout planes.



The Mother Ship "Shawmont," One of the Scouting Planes, and Four of the Big Flying Boats are Seen in This Photograph, Taken from Still Another Unit of the First Seagoing Air Fleet

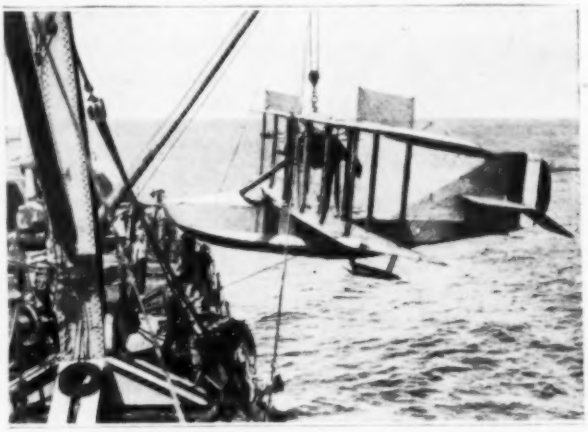
When, last spring, this aerial fleet was ordered to Cuban waters, the "Shawmont" picked up the scout planes at Hampton Roads, and proceeded to Guantanamo Bay. The six flying boats left the roadstead on the same day, and journeyed down the Atlantic coast, with two stops for fuel, to Miami, Fla. A day or two later they ran up their pennants in Guantanamo Bay, having completed in 32 hours a remarkable supermarine flight of 1,500 miles. Work with the fleet was begun on the following morning, and proved to be of four sorts. Bombing practice was perhaps the least arduous; while reconnaissance was enjoyed as the most sporting. The work of spotting the fire of the big guns was done with particular success; it is stated, indeed, that 90 per cent of the aerial observers, untrained as they were, furnished better reports than the spotters in the control towers of the battleships. The most interesting activity, however, was the fourth, which consisted, in coöperation with the submarine flotilla, in offensives against an enemy fleet reported in the vicinity. It was the business of the aerial fleet on these occasions to locate



The Former Mine Layer "Shawmont" Is Mother Ship to the Seagoing Air Fleet. On Board Are Workshops, Fuel Tanks, Storerooms, and Living Quarters; to the After Deck are Lashed the Small Planes

the hostile force, then to report by radio to the commander of the submarines its position, course, and speed, until the attack was made.

During almost two months of such campaigning the new aerial fleet demonstrated its self-sufficiency by refraining from any communication, except by radio, with the land. The airmen drew all supplies from the "Shawmont," and tendered all reports to the vessel's commander. During these weeks, too, the record of the organization was marred by only one serious accident. This occurred during one of the first days of the maneuvers when a high wind and engine trouble forced one of the seaplanes to the water off the southern coast. With seams opened by contact with the waves, the hull sank until the lower wings were awash. In this condition the craft was thrown by the surf against the cliffs until it broke up and disappeared. Meanwhile the airmen reached the shore after a desperate, bruising tussle with the surf. They soon saw small boats put over the side of the battleship "Mississippi," which had been advised of their plight by a companion seaplane; but so precipitious was the shore line that the exhausted airmen were forced to search the coast for five miles to find a cove into which their rescuers might venture.



A Seaplane being Lifted to the After Deck of the Mother Ship "Shawmont:" On This Deck the Smaller Planes are Lashed during Travel from Station to Station

SPEED OF ANTELOPE LEARNED BY EXPLORER IN AUTOMOBILE

The running speed of the antelope was ascertained in a picturesque and unprecedented fashion, it has been disclosed, during the recent expedition of the American Museum of Natural History into the little-known hinterlands of Asia. It has long been surmised that the antelope eludes the wolf and other desert enemies only by reason of marvelous stamina and fleetness. Its actual speed, however, has previously been a matter of conjecture. Accordingly, the leader of this expedition decided, while camped on a level waste of the Gobi Desert, to devote a day to chasing an antelope herd in his automobile. Mile after mile herd and car traveled parallel, while the motorist observed and noted the readings of his speedometer. Consulting these records later, he found that the herd had traveled at 60 miles an hour for almost two hours, and then had slowed down to about 50, or a little less.

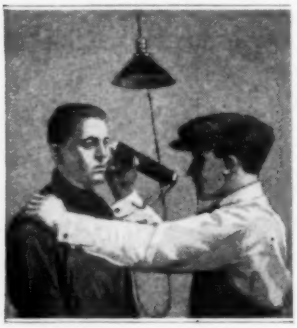
¶For the first time in three centuries the villagers of Oberammergau, Bavaria, have decided not to stage the decennial performance of the Passion Play. The war and its aftermath have so crippled local life that the custom may be abandoned.

WOMAN RENTS SERVICES AND VACUUM SWEEPER BY HOUR

The world-wide shortage of domestic labor is responsible for the recent appearance in London of the vacuum-sweeper specialist. Thus, the subject of the illustration on this page rents her services and her vacuum sweeper by the hour to her neighbors. Her talents being in great demand, she is obliged to carry her equipment from house to house many times during the day. These journeys formerly were almost as tiring as the work itself. But now the sweeper is pushed along easily on a wheel of the woman's own design. The wheel is mounted on a long rod to which the heavier end of the sweeper is strapped.

ELECTROMAGNET PULLS STEEL FROM EYES OF WORKERS

For the first-aid room of machine shop, steelmill, shipyard, or other establishment where flying metal dust and chips of steel menace the eyes of the workers, there is now made a small instrument of the type called "eye magnets." It consists of a powerful electromagnet, the core of which terminates in a blunted point. As the entire working end of the apparatus is incased in a knurled grip, and as a wire support transfers the weight of the magnet from the fingers to the forearm, the operator is able to use the point with unhampered facility and steadiness in removing the metal particle from the surface of the eyeball. Close to the point of the core is fixed a small bulb which is wired to shed a subdued light upon the affected eye. Current is taken from any lamp socket.



POWER IMPULSES IN LIQUID HANDLED LIKE ELECTRICITY

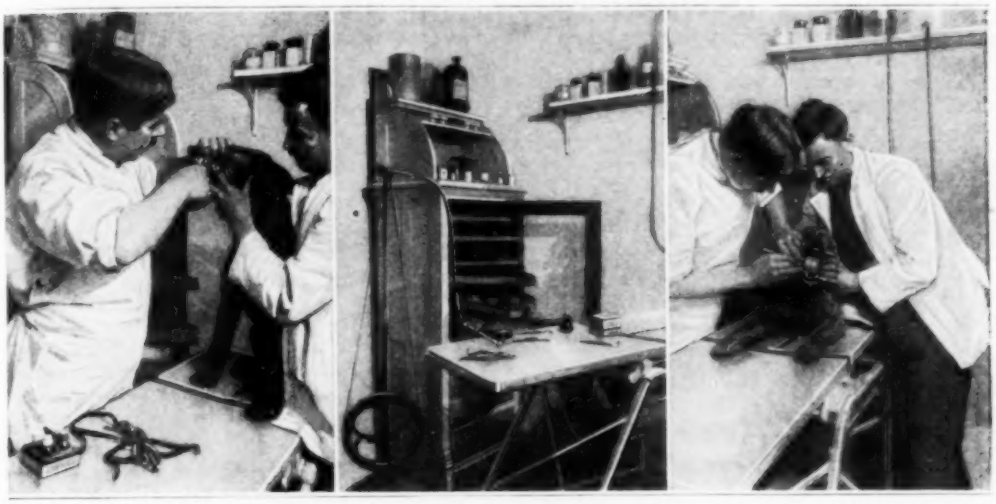
The problem of transmitting power impulses, or energy, through liquids has been studied since the war with remarkable success by the Roumanian scientist who invented the liquid-column machine-gun synchronizer, of which 40,000 were constructed for the British air service. In these later experiments with the vibration of liquid in a pipe, he has discovered, in short, that there must be taken into account elasticity of the liquid, mass, friction, and energy loss, just as the electrical engineer must reckon with capacity, induction, resistance, and leakage. And from this parallelism he has reasoned that every electrical mechanism has its liquid-vibration counterpart.

He has been led, therefore, to construct a number of remarkable machines actuated by these vibrations received through a liquid medium. The motors are of the most surprising efficiency and simplicity. Thus two 180-hp. units built recently for turning airplane propellers weigh only 66 lb. each, and are so small that, when mounted out on the wings, they add little to the air resistance of the craft. In the fuselage of the plane is placed, of course, the gasoline engine which drives the impulse generator which, in turn, actuates the propeller motors through the medium of the liquid in the connecting pipes.

GANG PLOW FOR VINEYARDS HAS REVERSIBLE SHARES

Two plows are commonly used in the cultivation of vineyards and hop fields, one shaped to turn the soil away from the vines, and the other to turn it toward them, as this alternate arrangement is necessary for these crops. Now a California inventor has devised a gang plow, suitable for a small tractor, in which the plows at the sides of the machine are reversible, and may be turned independently in either direction by two levers at the driver's seat. To avoid injuring the roots of the vines, the plows cut shallow furrows at the sides, and a deep one in the center. The swivel wheels are at the rear of the frame, permitting short turns.

Left: The Special Gang Plow for Vineyards and Hop Fields, Cutting Three Furrows and Turning the Earth in the Outer Ones in Opposite Directions. Right: The Plow being Pulled by a Small Tractor; the Two Levers at the Rear Control the Positions of the Side Gangs of Plowshares



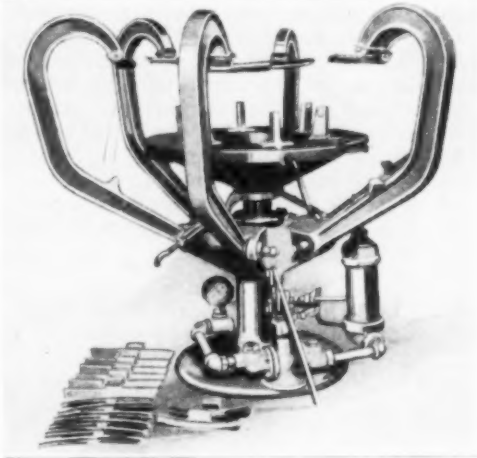
Left: Examining a Patient of the Canine Dental Laboratory for Defective Teeth or Pyorrhea. Center: Some of the Modern Equipment, Including Anesthetics, Used in Treating the Dogs. Right: An Assistant Holding the Patient's Mouth Open with a Padded Metal Frame While the Dentist Uses the Speculum

DENTAL LABORATORY FOR DOGS IN VETERINARY HOSPITAL

Dogs suffering from toothache, pyorrhea, dental abscesses, or other tooth troubles that are common to both the canine and the human races, are now relieved at an eastern veterinary hospital in the most approved modern manner. A completely equipped dental laboratory is a feature of this institution, and a highly successful one. It is the practice of the skilled dentists in charge of the department to cause their patients as little pain as possible, and to extract no teeth that might better be saved. The instruments used are similar to those of a regular dental office, except that instead of saying "Open, please," the operator inserts a padded metal frame in the dog's mouth that holds its jaws apart and provides the assistant with means for keeping its head stationary. When conditions warrant, anesthetics are used.

PORTABLE HYDRAULIC MACHINE SETS BIG TIRES QUICKLY

Tasks that are difficult to perform by hand soon bring forth designs of special machinery and tools. Mounting and demounting the enormous pneumatic tires used on many motor trucks require considerable effort and much pounding of the casings. A machine now on the market, made on the principle of the hydraulic press, does the work in from 4 to 10 minutes by easy foot pressure, and without injury to the tires. A round horizontal bedplate holds the big tire, which is then pressed against the hooked ends of six upwardly curving arms, pivoted to the base. Though hydraulic, the machine is self-contained, and may be carried on a service truck to the point where it is most needed.

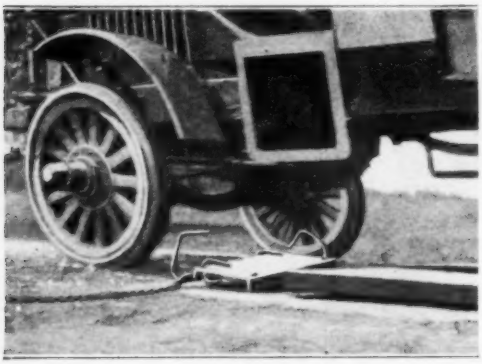


Portable Hydraulic Machine, Operated by a Foot Lever, for Mounting and Demounting Huge Pneumatic Tires

¶ The paint industry of Australia, handicapped heretofore by the high prices of imported materials, is now rejoicing in the discovery within 30 miles of Adelaide of a 60-acre deposit of ocher and sienna, both used in the manufacture of basic pigments. Approximately 70,000 tons of the ores are in sight.

GAUGE DESTRUCTIVE IMPACT OF TRUCKS ON PAVEMENT

To answer once and for all the arguments about pavement damage caused by



A Truck Passing over the Road-Impact Gauge: The Front Wheels Displace the Protecting Bridge, and the Rear Wheels Strike the Testing Plate

motor trucks, the U. S. Bureau of Public Roads is taking measurements of wheel impact with the aid of an ingenious mechanism. A concrete box sunk in the road contains a steel plunger, actuated by a steel plate flush with the surface. A rigid bridge prevents any recording of the passage of the front wheels, but in passing they displace the bridge and the rear wheels impact on the steel plate. They drop onto it from an adjustable approach of planks, from ¾ to 3 in. high. The effect is measured by the deformation of a standard copper cylinder, ½ in. in diameter and ½ in. long.

SPECIAL RAKE MADE FOR USE ON PUTTING GREENS

The caretaker charged with the maintenance of the putting greens of the golf course can now provide himself with a rake made specially for his use. In appearance it can be likened to a metal dust-

This Rake, Made Specially for Use on Golf Greens, Gathers All Clods, Sticks, and the Like, into Its Pan without Injuring the Grass

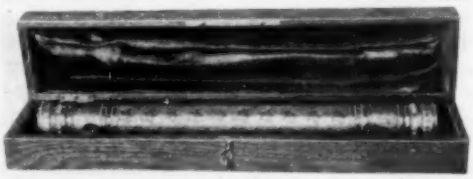
pan, six inches deep and almost three feet long, to which is attached a long handle. The edge of the pan is formed by 58 teeth, 2 in. long, and separated by intervals of ½ in. Because of this construction the rake gathers in its pan all clods, sticks, etc., when pulled over the green, without pulling grass or injuring the surface otherwise.

SPONGES TANNED TO INCREASE STRENGTH AND LONGEVITY

Sponges have been used by man for thousands of years, as is proved by early references to the Greek practice of stuffing them into war helmets; yet it has remained for an American professor of chemistry to devise what is practically the first process for improving their natural condition for industrial use. Like so much leather, according to his recent patent, they are tanned. This process affects them as it does leather, too, in that it increases strength and resistance to decay. Toilet sponges, of course, are not treated in this way, the process being meant only for the specimens used in laboratories, garages, and similar places.

AMERICAN CRAFTSMEN FINISH BATON FOR MARSHAL FOCH

As the fruit of 11 months' labor, craftsmen of a famous jewelry house in New

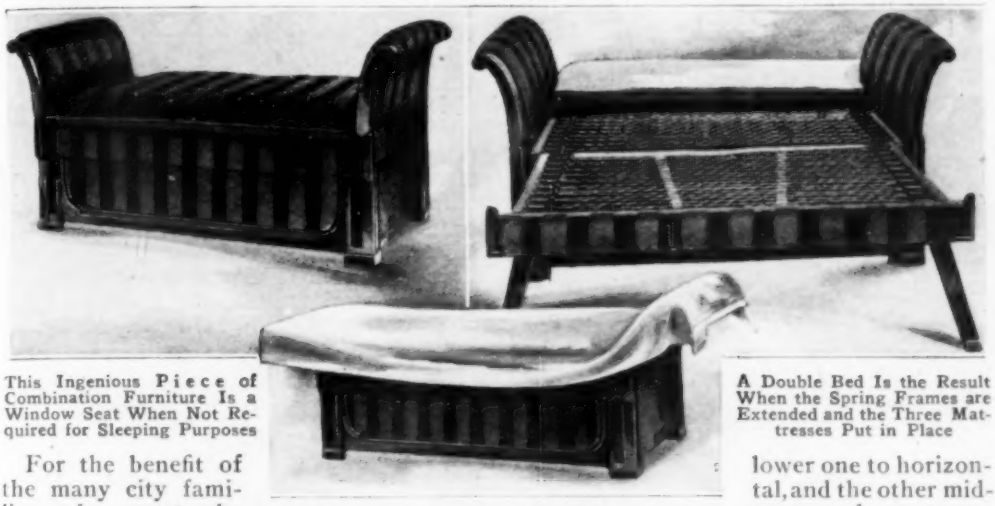


COPYRIGHT, UNDERWOOD & UNDERWOOD

Craftsmen of New York City Worked 11 Months to Complete This Gold Baton. It is to be Presented to Marshal Foch

York City have at last completed the baton, or truncheon, which the Knights of Columbus are to present to Marshal Foch of France at the unveiling of the Lafayette monument in Metz, on August 21 of this year. Measuring 20½ in. long, and weighing almost five pounds, the baton is formed of gold from California, sapphires from Montana, and ore from Pennsylvania. On the blue-enamel exterior appear 52 gold stars, each engraved with the name of an American state or territory. Circling the bottom are carved the names of the marshal's three most famous victories.

SEAT, COUCH, AND BED COMBINED IN ONE PIECE



This Ingenious Piece of Combination Furniture Is a Window Seat When Not Required for Sleeping Purposes

As the Armrests Are Adjustable, One can be Lowered to Horizontal and the Other Midway, So Changing the Seat to a Comfortable Lounge

A Double Bed Is the Result When the Spring Frames are Extended and the Three Mattresses Put in Place

For the benefit of the many city families who must eke out domestic comfort in the cramped interiors of family hotels and apartment houses, an American inventor has recently produced a promising piece of combination furniture. In the daytime it appears, and is used, as an upholstered window seat, 4½ ft. long, and fitted with armrests at the ends. As these can be inclined at any desired angle, it is easy to lower one to horizontal, and the other midway, and so transform the seat into a day bed, or reclining couch. At retiring time, finally, bed clothes and the three sections of the mattress are taken from a deep compartment in the bottom, and the three spring frames of the top are extended to make a bed about 4 ft. wide and 7 ft. long. One mattress section is placed, of course, on each spring frame.

ARTIFICIAL LAKE BECOMES RESORT FOR TEXAS TOWN

THOUGH far away from any large natural body of water, Wichita Falls, in northern Texas, now has its own lake and lakeside resort 10 miles to the southwest of the city. The project was inaugurated some time ago by the construction across a wide arroyo of a large dam. Accumulating behind this dam for many months, the drainage from three counties has finally created Lake Wichita, measuring one and a half miles wide by seven miles long. For the benefit of the people of the city, a trolley line has been built to the shore. At the terminus of this line there has been erected, too, the magnificent pavilion pictured above. Here rowboats can be rented by those who would angle for the fish with which the lake has been stocked.

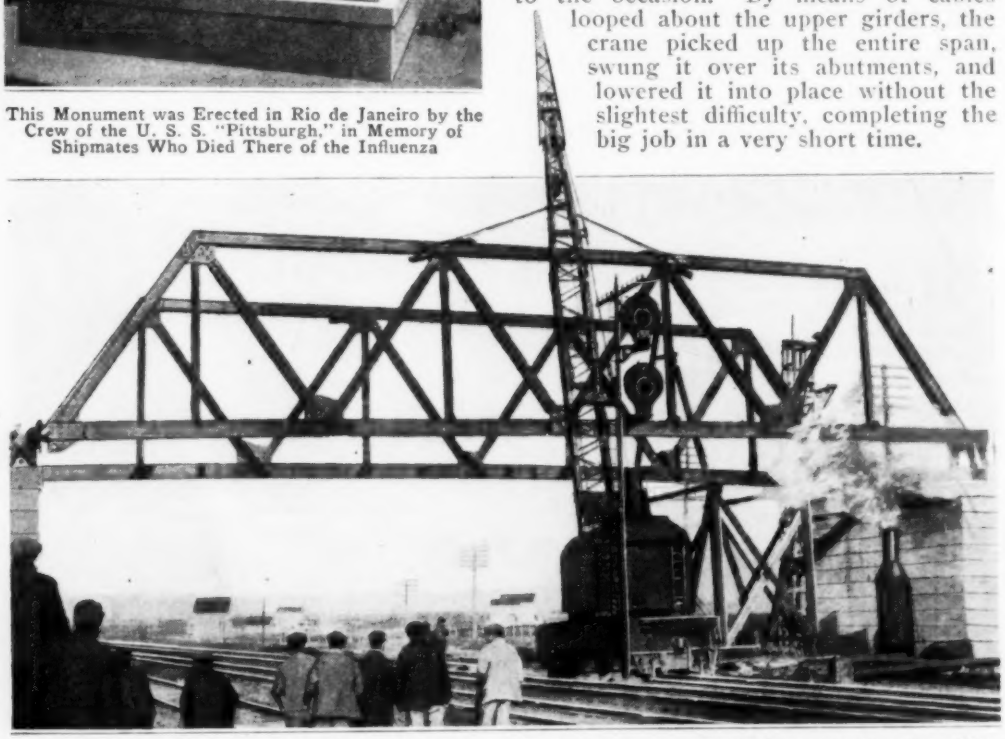
AMERICAN SAILORS REMEMBER DEAD COMRADES IN BRAZIL

A photograph taken by a member of the American Naval Commission to Brazil now rests in the files of the Navy Department at Washington, D. C., as record and proof of the sense of loyal comradeship that animates the men of the American service. It depicts an obelisk of white granite on a broad base of the same material. On the shaft are carved these words: "Erected by the Crew of the U. S. S. 'Pittsburgh,' in Memory of Their Shipmates Who Died from the Influenza, October-November, 1918." Below are the names and ratings of the 41 who died. The monument stands in a beautiful cemetery in Rio de Janeiro, for it was in this port that the epidemic took its terrible toll. The graves will be tended by the American Patriotic Society of Rio de Janeiro as a perpetual trust.

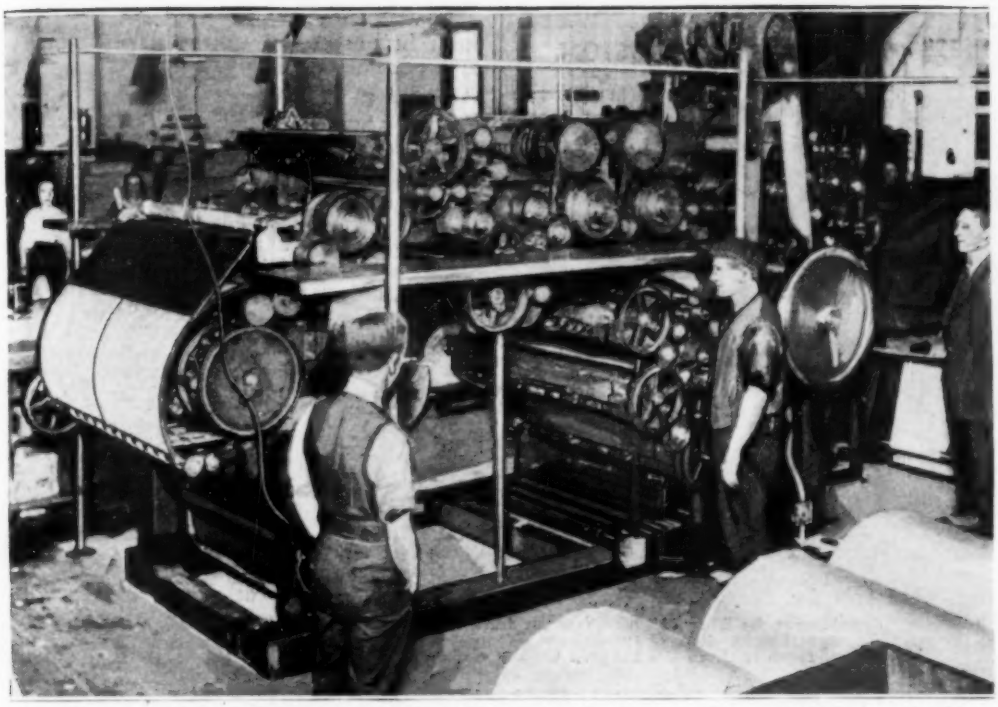
This Monument was Erected in Rio de Janeiro by the Crew of the U. S. S. "Pittsburgh," in Memory of Shipmates Who Died There of the Influenza

ENTIRE BRIDGE SPAN PLACED BY LOCOMOTIVE CRANE

Installing a steel bridge of any size is usually a task of considerable circumstance, and seldom is it accomplished with the ease and celerity that marked a recent performance on a railroad in Ohio. When the completed structure, 100 ft. long, was ready to be placed, no machinery was available except a locomotive crane on the rails below. This piece of equipment, however, proved wholly equal to the occasion. By means of cables looped about the upper girders, the crane picked up the entire span, swung it over its abutments, and lowered it into place without the slightest difficulty, completing the big job in a very short time.



A Locomotive Crane on an Ohio Railroad Lifting the Entire Span of a 100-Foot Steel Bridge into Place without Assistance: The Big Structure was Swung into Place over Its Abutments without Difficulty



Huge Press for Printing Express Waybills: It Prints, Perforates, Punches, Folds, and Carbonizes the Paper, and Numbers, Dates, and Addresses Each Bill, Performing 16 Distinct Operations. Prior to the Installation of This Press the Preparation of the Paper Forms, of Which Enormous Quantities are Consumed Daily, Involved the Use of Four and Five Machines

EXPRESS WAYBILLS PRINTED COMPLETE BY NEW PRESS

Every express shipment requires a waybill, and the quantity of the paper forms used daily is enormous. Heretofore the printing of these bills has involved the use of four or five machines, but an ingenious press just added to the equipment of a large eastern plant completes the job in a single run. The paper is printed, perforated, punched, folded, and coated with carbon, and each bill separately numbered, dated, and addressed. In all, the new press, which is a huge and complex machine, performs 16 distinct operations, and delivers the waybills ready for use in the express offices.

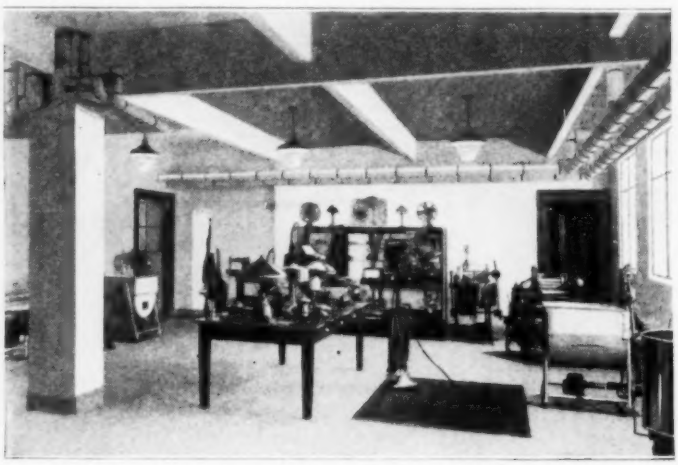
FREAK FISH FOUND IN NET BY CALIFORNIA FISHERMAN

A wearied marine monster blundered into the net of a San Diego fisherman not long ago. On being pulled into the fishing smack by the astonished captain, it was found to measure a little more than 15 feet long, and in general configuration to resemble a shark. Its upper jaw was surmounted, however, by a clumsy-looking horn of solid bone. When it had been photographed, the creature was sold to a fertilizer plant. A month after its destruction there, a prominent scientist notified the fishing captain that he had caught a female of the species "basking shark," of which only six are known to have been taken during the history of the world's fishing industry. Of these but two have been mounted, one in Vienna and one in Berlin. The captain would, doubtless, be a richer man if the information had reached him before the sale.

This Rare Fish was Caught Off San Diego, California. The Mouth has been Propped Open to Bring into Prominence the Clumsy Horn

LAMPS BEHIND FALSE WALL GIVE DAYLIGHT ILLUSION

Day and night, to all appearances, the sun shines cheerily into the basement salesroom of an electrical-fixture store in London, Ont. As the room is surrounded by unbroken foundation walls, appearances are obviously deceitful. The effect was achieved, in fact, by the erection of a dummy partition, on the street side and two feet distant from the foundation wall. In this partition were set three large windows with panes of ground glass. Between partition and wall, and above the windows, were fixed several powerful nitrogen lamps. Light from these, directed downward and outward, is deflected through the windows. Here it is given the diffused quality of ordinary daylight. The illusion was furthered by the application to walls and ceiling of a delicate sky-blue tint.



Back of the Windows at the Right of This Basement Salesroom Are Several Powerful Nitrogen Lamps. Passing through the Ground-Glass Panes, Light from These is Given the Diffused Quality of Daylight

STOLEN PLATINUM IS TRACED BY CHEMICAL ANALYSIS

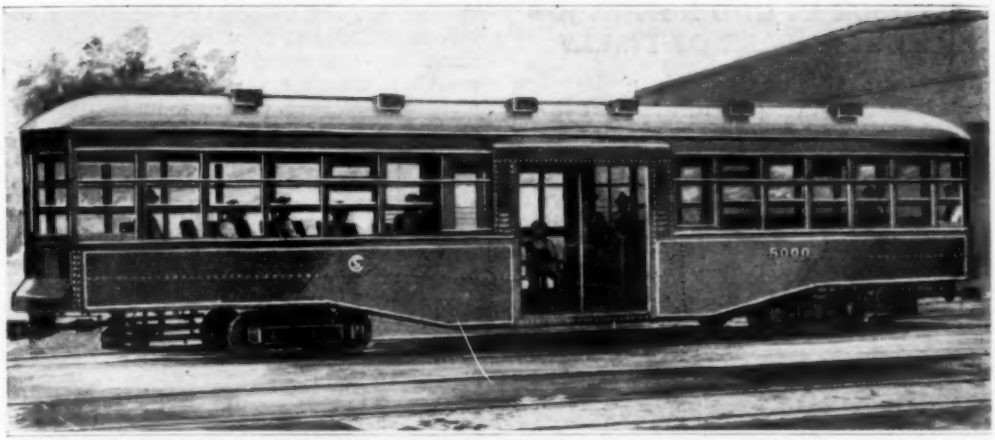
Solution of a large and vexing problem in criminology by the application of delicate methods of chemical analysis, a feat recently performed by government scientists, may well be classed among the facts that are "stranger than fiction." Two men had been arrested while attempting to sell 280 oz. of sponge platinum at $100 an ounce. It was found that all the precious metal reported missing by government and industrial laboratories did not equal this amount, which the suspected men claimed to have mined in Canada.

It was known, however, that the platinum in possession of the various plants and bureaus varied in composition, some stocks containing traces of iridium, and some palladium, or other rare elements. Inventories of known stocks were immediately requested, and the confiscated lots were checked against these returns. With the information thus gained as a foundation, supplemented by keen detective work of a less technical character, the stolen platinum was traced to its two sources, munition plants in West Virginia and Tennessee. By replacing the abstracted metal with a mixture of mercury and moist earth, the culprits had been able to prevent detection of the gradually diminishing stores. But they failed to realize that the very rarity of their booty gave it individual identity in the scientific records.

AUTOMOBILE TOOL SPREADS DEMOUNTABLE SPLIT RIMS

The work of replacing automobile tires on demountable split rims is easy when the motorist is equipped with a new tool, made for the purpose. It consists of two slotted bars, each terminating in a claw which grasps the rim. Passing through the slots, and pivoted to each bar, is a lever. As the lever is moved, the claws are forced apart and the rim snaps into position. The tool can be adjusted to fit a split rim of any size.

As the Lever of the New Tool is Moved to the Left, the Claws are Forced Apart and the Split Rim is Snapped into Position



CHICAGO EXPERIMENTS WITH BIG TRAILER CAR

WITH a sense of personal interest the people of Chicago, Ill., have lately watched the passage through the downtown streets of the city's first trailer car. For they know that on the performance, the manageability, etc., of this trailer, built in a local shop, depends the company's decision to build or not to build 200 more after the same pattern. This experimental car is unusually long, and is provided with wide sliding doors in the middle. The seating capacity is brought up to 62 by the provision of semicircular seats at both ends.

COMPANY ORGANIZED TO TRACE AND RETURN LOST BAGGAGE

A company has recently been organized in the Middle West, with branch offices throughout the country, for the purpose of recovering and returning to the owners lost suitcases, handbags, trunks, and other articles of luggage. To avail himself of this protection, the traveler gives the company a small fee, his name and address, and a description of the article. These data are placed on file in the central office. In return the company fixes permanently to his article a metal plate marked with an identification number. Having obtained the coöperation of hotels, transfer companies, baggage companies and similar agencies, the company anticipates little difficulty in tracing pieces of baggage so registered.

¶Storage batteries of the nickel-iron type are made by a new method in a Swedish inventor's laboratory. The active material, in briquette form, is fed mechanically between two strips of perforated nickel-steel, which are then crimped together in a steel frame, and rolled into solid contact with the active material.

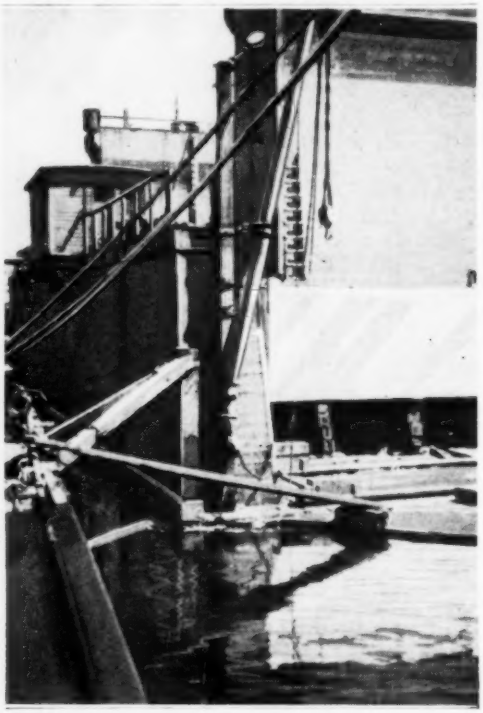
COPYRIGHT, UNDERWOOD & UNDERWOOD

FIRST PHOTOGRAPH RELEASED BY CREATOR OF BAT-WING AIRPLANE

THIS photograph, apparently of an accurately made model, is remarkable as the first ever released from the mystery-veiled establishment in Detroit, Mich., where, it is said, 1,000 men are or were employed on the construction of the bat-wing airplane which is soon to fly from Detroit to New York City. This projected flight was announced, it will be remembered, in Popular Mechanics for August. The large plane now being groomed for the test was there described as powered by several engines distributed along and entirely within the leading edge. But smaller, single-engined planes of this revolutionary type will differ slightly, it may be assumed from the photograph, in that they will bulge downward into the semblance of a fuselage for the accommodation of the power plant.

DRYDOCK IN ODD REPAIR JOB TAKES IN PART OF ITSELF

Part of a floating drydock, undergoing repairs in the other part of the same dock, was the curious condition made necessary by a recent emergency in an eastern shipyard. The big drydock, built on the unit principle, was rammed by a tug, and so badly damaged that it threatened to sink. The defective section was quickly detached, and the uninjured remainder made into a somewhat shortened but complete dock for the reception of the smashed member, which was floated into its submerged inclosure in the usual way. The unit was then raised and repaired like a ship, and soon was restored to its former place in the assembly.



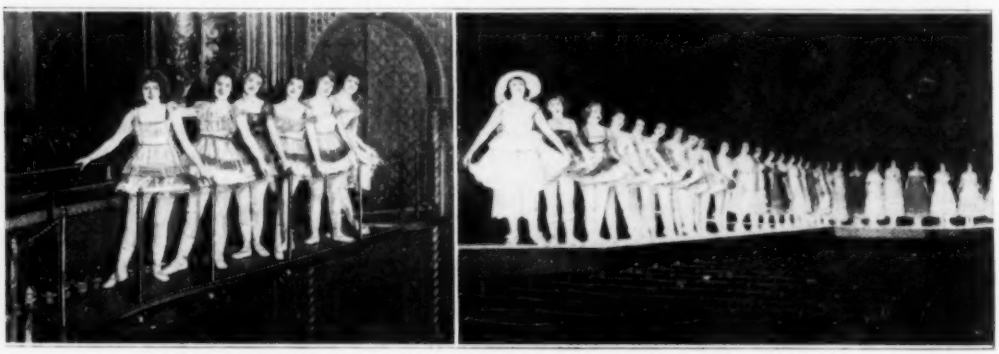
The Injured Part of the Drydock, with Repairs Practically Complete, Floating inside the Uninjured Part, a Method of Treatment Made Possible by the Unit System of Construction

ANTS GUIDE PROSPECTORS IN DIAMOND FIELDS

As a result of the recent exploitation of the new diamond-bearing areas in northwestern Cape Colony, the ants of south Africa, long regarded as the worst of pests, are now coming to be recognized as invaluable allies of the diamond prospector. Examination of the great ant-heaps, that is, has several times revealed the presence of mica, brought up from the subsoil by the insects, and so has led to the discovery of diamondiferous ground.

THEATER "RUNWAY" EXTENDS ALONG EDGE OF BALCONY

Proprietors of revues, musical comedies, and burlesque shows have for several seasons been familiar with the merits of the "runway" as a means for stimulating in the audience a lively interest in the performers. As usually built, this runway extends from the middle of the footlights to the back of the house. But in one theater in San Francisco the idea has been developed practically to its limit. In addition to the glass-topped structure in the orchestra, runways extend along the front of the first balcony, and over the boxes. The outer edge of each is furnished with an ornamental yet substantial railing for the protection of the girls. Electric bulbs line the inner edge.



In Addition to the Glass-Floored Runway in the Orchestra, Pictured at the Right, the Theater is Equipped with a Runway along the Front of the First Balcony, and Platforms over the Boxes. These are Shown at the Left. The Railing Guards the Girls against Tumbles into the Audience Below

This Oriental Structure Adorned a Business Street of Portland, Oregon, during the Days of the National Convention of a Large Fraternal Order. Colored Jets of Steam Rose, at Night, from the Eight Incense Burners, Six of Which are Seen in the Photograph

EGYPTIAN ARCH SPANS STREET OF AMERICAN CITY

An arch of striking monumental design was the pivotal element of the decorative scheme which recently beautified the streets of Portland, Ore., during the days of the national Shriner convention. In architecture the structure suggested the Egyptian, by reason of its columns of truncated-pyramidal form, and the two sphinxes atop the smaller flanking arches. Atop the middle arch were three allegorical figures in Oriental garb, one of them astride a camel. At night the structure was flooded with light from near-by buildings, while smokelike jets of steam, colored by electric illumination, ascended from eight large incense burners.

UNLOADING QUICKENED BY USE OF LAGE HOPPERS ON DOCKS

To expedite the unloading of grain ships at its ocean docks, a western railroad has constructed at the water's edge several novel towerlike structures. A square hopper, measuring about 25 ft. on each side, forms the top of each tower. Into these capacious funnels the ship's crane drops the bags of grain, or similar material; from the hoppers the bags slide down chutes into waiting wagons or railroad cars. Use of the towers permits unloading to go forward at increased speed, as the crane loads do not have to be spotted with time-consuming accuracy. The towers can be moved along the dock as desired.

Bags of Grain are Easily and Quickly Dropped by a Ship's Crane into One of These Hoppers. Thence the Bags Slide into Waiting Wagons or Cars

HOW ALTITUDE RECORDS ARE ESTIMATED

Discrepancy between Bureau of Standard's and Fédération Aéronautique Internationale's Statement of Major Schroeder's Flight Explained

IN an announcement from the office of the director of Air Service, U. S. A., May 25, official figures were given concerning the altitude flight of Maj. R. W. Schroeder, on Feb. 27, 1920, at McCook Field, Dayton, Ohio. A LePère biplane driven with a 12-cylinder Liberty engine equipped with a supercharger, was used. The altitude reached, as computed by the *Fédération Aéronautique Internationale*, by the 1919 method, was 38,180 ft. The most probable altitude (Bureau of Standards method) is 33,000 feet.

The difference between the two figures given is 5,180 ft., or just exactly 100 ft. less than a mile. The explanation of this discrepancy in the two values is a matter of very general interest. From information which is at present available, the greater part of the difference arises from temperature considerations which enter into the computation of the altitude. In the method referred to as used by the international federation, the mean air temperature of +10° C. was assumed. It fits closely the conditions of flight at relatively low altitudes, say, from 12,000 to 15,000 ft. The use of this method, however, does not represent correctly the actual conditions in respect to the high altitude reached by Major Schroeder.

In his case temperature observations were made by means of thermometers. Actual values for the temperatures were therefore available. The average or effective temperature obtained from his record, and used in figuring his altitude, was something like —30° C. The use of this figure in place of the arbitrary value of 10°, is chiefly responsible for the difference in the two sets of figures reported.

In this connection it may be stated that the federation recently issued a formula to be used in altitude determinations. According to the best present advice, the use of this, the so-called 1920 formula, will give results much more in accord with those of the Bureau of Standards, although this formula, as well as the one used in the 1919 method, is based solely upon pressure considerations and makes no allowance for temperature of the air. Thus it will be seen that the *F. A. I.*, for the purposes of establishing altitude records does not consider temperature either by the old or new method; and the making of a new record simply means that the pilot has flown in air of lower atmospheric pressure than the former holder of the record.

Temperature should enter into the determination of the height of a flight for the reason that the altitude, as shown by the aneroid barometer, is determined from the change in air pressure. Cold air is more dense than warm air. A given change in altitude in cold air, other things being equal, will cause a greater change in pressure than would be the case with warmer air, and conversely, a change in pressure represents a greater change in altitude in warm weather than in cold. The assumption of a temperature higher than was actually present would lead to a figure for altitude greater than the actual height.

It should be clearly understood, however, that this question of formulas does not prejudice the record of Major Schroeder as compared with other high-altitude records. Indications are that the use of the correct temperature, as was done in the case of Major Schroeder, would reduce in the same manner the figures for various high-altitude records previously obtained. For this reason the figures of the *F. A. I.* of 38,180 ft., are of value and interest for comparative purposes. Major Schroeder, it may be said, appears to have the world's record for altitude by a good margin.

The following table gives the comparative figures for Major Schroeder and those of his nearest competitor, as determined by the three methods mentioned.

	1919 F.A.I.	1920 F.A.I.	Bureau of Standards
Schroeder	38,180 ft.	33,120 ft.	33,000 ft.
Rohlf	34,910 ft.	29,770 ft.	31,400 ft.

NEWSPRINT AND OTHER PAPER MADE FROM BRITISH PEAT

Peat, long used in Great Britain and Ireland as a substitute for coal, now gives considerable promise of taking the place of wood pulp for the manufacture of paper. Experiments recently conducted in Manchester, England, demonstrated the possibility of making a usable grade of newsprint from bleached peat pulp, and the inventor displayed samples of other papers of various tints, suitable for wall papers, wallboard, wrapping paper, etc. For better grades of stock, it is proposed to mix the peat pulp with wood pulp, thereby reducing the consumption of the latter. The coarse roots removed from the peat have a by-product value for brush making.

In the Inventor's Hands, Above, can be Seen the Reflecting Apparatus by Means of Which the Operator Is Able to Photograph Rapidly Moving Objects without Turning the Camera. In Use, the Camera is Not Even Pointed at the Object

COPYRIGHT, KADEL & HERBERT

A Rabbit is being Photographed, at the Right, with the Aid of the Swinging Mirror. In the Operator's Left Hand Is the Long Sighting Arm with the Finder Lens on the End. The Mirror is Moved with This Arm. At the Left Are Two Samples of the Work Done. It will be Noticed That the Bird is Seen near the Center of Each Exposure

FAST MOVIE CAMERA USES SWINGING MIRROR

Designed particularly for making motion pictures of birds and animals, a new French camera, with a speed of 250 exposures a second, is remarkable for its ingenious method of keeping the moving object in the field of the lens. Movably attached to the lens tube is a metal ring, with a flat mirror pivoted at one side. A long sighting arm, with a finder lens on the end, enables the operator to follow the object in any of its movements, as a gunner follows a flying bird. The sighting arm is so connected to the pivoted mirror that they move together in geometrical relation, and an image in the center of the finder is always reflected into the center of the camera lens, regardless of its position. In use, the camera is not pointed at the object, but approximately at right angles to it. The flight of birds, and even of projectiles, may thus be recorded for further study, the object being in about the same position on each picture.

VANISHED CURRENCY REPLACED BY ORDINARY BUSINESS CARDS

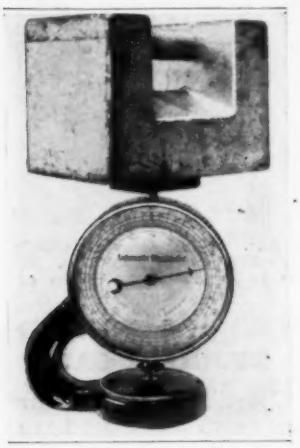
Business and advertising cards, now torn and dirty from much handling, have been circulating as money in Papeete, Tahiti, travelers have been surprised to find, since the middle of October, 1919. At that time, and in some manner not ex-

Citizens of Papeete have been Transacting Their Lesser Business for Half a Year by Means of Business Cards, Stamped and Certified as Shown

plained, all the small silver coins dropped out of circulation as though dumped into the water that girds this small island of the southern Pacific. Financial confusion ensued. Determined to establish a medium of exchange, at last, one of the business firms offered as currency its own business cards, bearing above the proprietor's signature the words "Good for 50 centimes," one franc, or two francs, as desired. This example was followed by all the leading firms, eventually, with the result that the trusting citizens of Papeete have been transacting their lesser business for more than half a year with this heterogeneous, makeshift currency.

QUEER MICROMETER MEASURES WEAR ON DENTAL FILLINGS

Unusual tests require unusual tools. A micrometer of interesting type, closely resembling a spring scale, has just been designed by the Bureau of Standards for the special purpose of investigating the results of pressure and impact upon dental amalgams. The dial is graduated in thousandths of an inch, the entire circle representing but ¼-in. movement of the points. The specimen of tooth-filling compound, .16 in. in diameter, is inserted in the jaws below, and a weight is placed on the pan at the top. With a pressure of 3,200 lb. per square inch, amalgam, one-half to two hours after packing, was compressed only four per cent in 30 minutes. In some cases it was completely crushed in 20 hours of the same pressure, or in three minutes or less by 32,000 lb. Equivalent pressures are declared quite possible in chewing food.



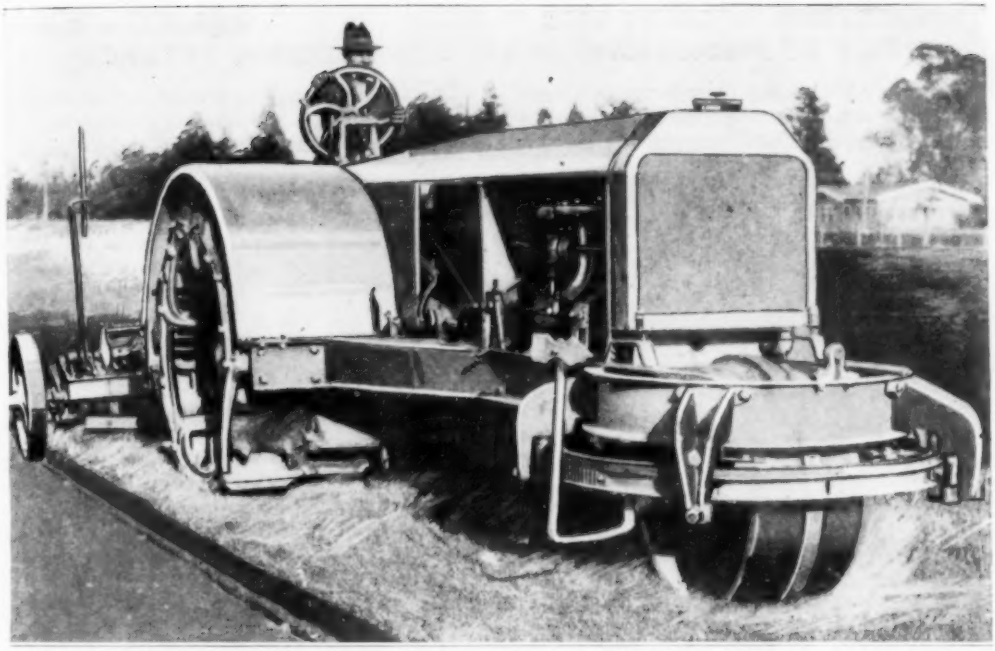
RECOVERY OF GREASE IN WOOL SOUGHT BY FEDERAL CHEMISTS

It has long been known that a number of valuable substances can be obtained from wool-scouring wastes; only lately, however, have the specialists of the Bureau of Chemistry tried to learn whether or not these can be obtained in quantity, and at costs that will make this recovery feasible. They find that grease suitable for use in leather dressing and in the manufacture of cosmetics and ointments can be secured from the wool of the "Ohio delaine" variety, for instance, at the rate of 17.8 to 41.9 lb. of grease to every 100 lb. of unscoured wool. The utilization of such a percentage is obviously well worth the attention of the wool-scouring industry.

GARAGES TO BE DWELLINGS UNTIL HOMES ARE BUILT

A neighborhood housed exclusively in garages may now be seen outside Los Angeles, Calif. The situation is a result of the shortage of homes in the city, coupled with a real-estate company's desire to sell the subdivision. Realizing that the present inflation of values puts the erection of a home out of the question for the average buyer, the company has constructed on each lot a tiny four-room bungalow-garage. Here the purchaser of the lot will live until conditions revert to normal, when he will probably build a permanent home. He will then tear the partitions out of his temporary dwelling, widen the door, and run in his automobile.

At the Rear of Each Lot in the New Subdivision, as Illustrated at the Right, Is a Little Building That is to Serve as the Buyer's Home Until He Decides to Erect a House. A Few Alterations will Then Transform the Building into a Garage. One of the Completed Bungalow-Garages is Seen at the Left



A Tractor with a Double Row of Shoes on Each Broad Driving Wheel, Giving a Contact Surface of 500 Square Inches with the Ground: The Power may be Thrown to Either Wheel for a Short Turn

SHOES GIVE TRACTOR WHEELS LARGE BEARING SURFACE

Ground-bearing surface of 500 sq. in., with drivewheels alone, is obtained in a new tractor, invented by a western farmer, by equipping each broad wheel with a double row of shoes that operate like an endless tread. As a result, the ground is not packed ahead of the implements, and the shoes clean themselves of soil. Each wheel has its own driving gears, and the engine power can be shifted, by means of a clutch, wholly to either one for a short turn. The special transmission gives two speeds forward and one reverse without throwing the gears out of mesh. A feature of the machine is that nearly all its working parts are incased and run constantly in oil.

TWO DRINKS MIXED AT ONCE BY SODA-FOUNTAIN MACHINE

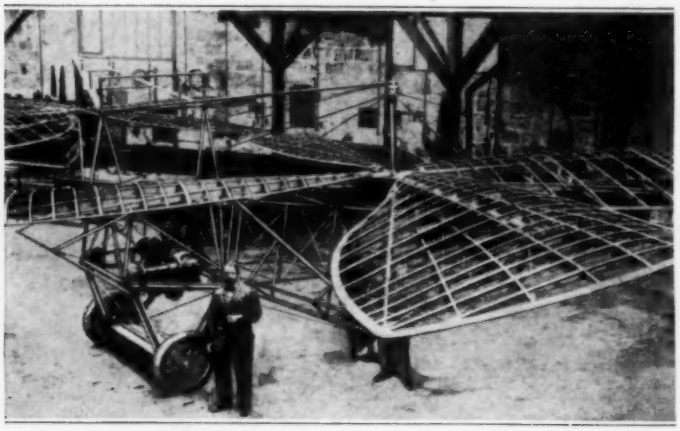
A recently invented drink-mixing machine for the soda fountain is of duplex construction; it has one electric motor, that is, which drives either one or both of two dashers. In consequence, two drinks can be mixed simultaneously. The motor, in its central, waterproofed casing, is started when either one or both of the dasher spindles are pressed down into the mixing cups. These are in themselves of peculiar design, each having in the interior two baffles, or deflectors, so that the liquid does not rise above the top at even the highest peripheral speed.

This New Drink-Mixing Machine for the Soda Fountain Has One Electric Motor Which Drives Either One or Both of the Dashers

¶A motion picture showing the destructive habits of the gopher and methods of extermination was recently exhibited before an assembly at the Oregon Agricultural College.

HELICOPTER OF GREAT SIZE BUILT BY FRENCHMAN

Stimulated by recent offers of large money prizes, a number of French aeronautical engineers are busy with the construction of vertically rising, heavier-than-air machines. The largest of these is a helicopter characterized by its unusually large size and substantial construction. The wings resemble in plan the leaves of a four-leaf clover, and are carried on metal tubes which radiate from a central upright. This upright is mounted on the middle of the metal fuselage, and is revolved by a nine-cylinder radial engine.



The Fuselage of This French Helicopter is Seen to Resemble That of an Ordinary Airplane. Halfway between Nose and Tail is Mounted the Upright with Its Four Radiating Wings. These are Revolved by the Engine at the Left

COMMERCIAL CHEMICALS MADE IN ELECTRIC FURNACES

The widespread substitution of electricity for expensive chemical reagents in the manufacture of commercial phosphoric acid, potash, and similar substances, may possibly be presaged by a recent activity of a southern company. In its electric furnaces, during the war, this concern made synthetic pig iron, ferromanganese, and similar products. After the armistice, however, the demand declined and it was resolved to attempt the manufacture of phosphoric acid and potash. After much experimentation the company evolved the entirely successful method now in use. Phosphoric acid is obtained by first smelting phosphate rock in the furnaces. Thence the phosphorus goes over as phosphoric acid, suspended in the gases. Collected and treated by a second process, also electrical, these gases yield the phosphorous compounds as a fine powder. In the making of potash, likewise, electricity is employed both as the breaking-down agent, and as the medium by means of which the final products are recovered.

FREAK LIGHTNING BOLT BUTCHERS FLOCK OF SHEEP

A JARRING crash of lightning interrupted the rest of two herdsmen recently as they slept near their flock of 1,250 sheep on the range above the American Fork Cañon, in north central Utah. A hurried walk of some 200 feet brought them to their charges; the photograph, taken several days later, suggests what they found. Striking the close-gathered flock, as a scythe the standing grain, the lightning had cut two wide swaths, about 250 sheep in each. One of these stretches, in the photograph, from the foreground into the background at the left. Between these swaths and on either side, the animals were not touched. The monetary loss was estimated at $10,000 or more.

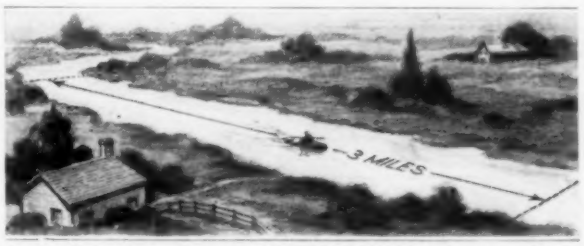
THE TWO SIDES OF THE ETHER PUZZLE

Who Is Right, Sir Oliver Lodge or Einstein?

BY ROGERS D. RUSK, M. A.

IS there an ether? Or is space empty? Sir Oliver Lodge says there is. The much-famed Einstein says there is not.

If there is an ether, the earth must be flying through it at the terrific rate of 19 miles per second, traveling around its orbit. It is difficult to believe the ether is streaming past us at this rate and even through our own bodies without our ever feeling it. But if there is no ether, how do light waves reach the earth from the sun, and how does gravitation hold the planets of our solar system together?



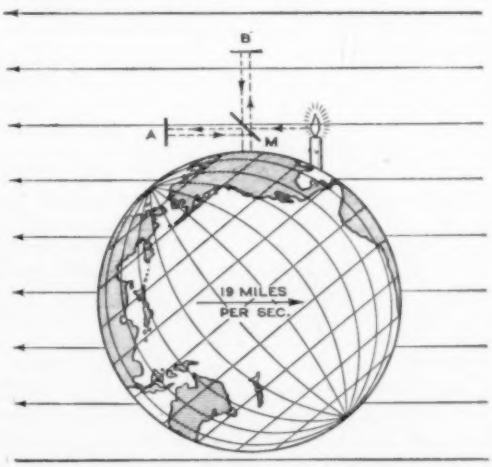
The Scientists' Experiments, to Decide Whether the Ether Moves with an Object Passing through It or Remains Stationary, were Based on the Facts Observable When a Man Rows a Boat Upstream against a Current and Downstream Again, as Compared with Rowing It in Still Water

Sir Oliver Lodge has concluded from a lifelong study of the problem that the ether is the most important thing in the universe; that it is the fundamental substance of which atoms and worlds are made, the essence of electricity, and perhaps even the connecting link between mind and matter. If it fills all the universe, it must be the greatest substance in both weight and volume. If it sustains the sun's pull on the earth of some billion billion tons, it must be stronger than the strongest steel.

However, no one has ever been able to detect its actual presence. Only some of its properties have been discovered, of which by far the most important is its power to transmit waves of light at the almost incredible speed of 186,000 miles a second, whether the waves be large or small, short or long. A tiny light ray of infinitesimal strength reaches us unchanged after traveling from a distant star for perhaps a thousand years.

Einstein bases his theory on the fact that the ether has never been actually detected. Hence he is led to ignore its existence altogether, and it is this bold stroke that has brought him his remarkable results. The facts in the case are really quite simple. It is the complicated mathematical theory that Einstein's brilliant genius has built which is difficult for even a good many scientists.

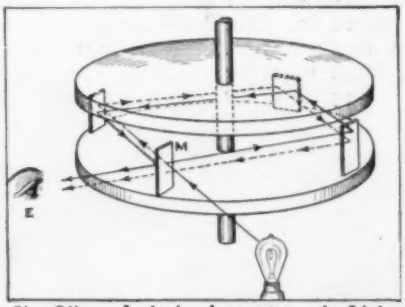
The impossibility of detecting the ether is shown by two famous experiments. Sir Oliver Lodge himself performed one of these and a few years earlier Michelson and Morley, of this country, performed the other. At first it seemed they exactly contradicted each other, and that is why Einstein was led to ignore the ether completely.



The Large Horizontal Arrows Represent Apparent Countercurrent Set Up in a Stationary Ether by the Earth's Motion. A Light Ray, Represented by Dotted Lines, was Split by the Silvered Glass M, One Part Passing through It and the Other being Reflected by It, and Then Returned to the Observer's Eye by Mirrors A and B. The Horizontal Part of the Ray was Expected to be Retarded by Going with and against the Ether Current, and Thus to Cause a Disturbance in the Light Returned to the Observer. No Such Result Was Observable

Both of these experiments made use of very simple mechanical principles and applied them to the theory of light. A boat moving upstream is retarded by the current, and moving downstream is accelerated by it. But if a boatman rows a certain distance upstream and back, it takes longer than if he rowed the same distance in still water. At first it looks as if the loss in speed in going upstream would be compensated by the gain in speed while coming back downstream. That this is not the case may be shown by a simple calculation.

If a boat travels at a speed of two miles per hour in still water, it will travel three miles and back in exactly three hours. If the boat is rowed upstream against a current of one mile per hour, its speed will be 2—1, or one mile per hour, and it will take three hours to go the three miles upstream. On the return trip its speed will be 2+1, or three miles per hour, and it will therefore return in one hour, making a total of four hours for the round trip against three hours for the same distance in still water. The reason is obvious. The boat going upstream loses speed for three hours, while on the return trip it gains speed at the same rate for only one hour, thus losing more than it gains. The same would be true of a light wave in the ether if the wave were reflected up and down an ether current by a suitable mirror.



Sir Oliver Lodge's Apparatus: A Light Ray, Split and Reflected as in Morley's and Michelson's Experiment, was Passed between Two Rapidly Spinning Disks, One Part with and the Other against the Direction of the Disks' Rotation. If the Ether Moved with the Disks, a Disturbance should Occur in the Light Returning to the Observer's Eye, but in This Case, Too, the Experiment Failed to Reveal Any Disturbance

Michelson and Morley applied this principle in an attempt to detect the streaming of the ether past the earth as the earth flies through space. For this purpose an apparatus was devised in which a beam of light was split into two parts by a thinly silvered glass, one half of the beam passing on undeflected through the glass, the other half being reflected exactly at right angles to the first half. Both beams were then reflected back again by two mirrors, arranged as shown in one of the diagrams, to reunite and be observed by the eye.

If there were any motion of the ether relative to the earth, the beam traveling along the line of motion would be retarded just as a boat would be retarded by a stream of water. The other beam traveling across the line of motion of the ether would suffer no change in its time of transit, hence the first beam would lag behind and the two would not reunite as if they had both followed a path of the same length. This would produce a disturbance in the light, visible to the observer at the silvered glass, where the beams emerge. But when the experiment was tried, there was not the slightest evidence of the ether slipping or moving past the earth. This seemed to indicate that the ether travels with the earth, and at exactly the same speed.

So it was that Sir Oliver Lodge set himself the task of finding just how moving matter carries ether with it. In describing his own apparatus on which he worked during a period of six years he says: "I took two steel disks, a yard in diameter, clamped together with a small space between. The plates were mounted on a vertical axle so they could be spun as fast as they would stand without flying to pieces." The arrangement is shown in the other diagram. Here again a beam of light is broken up into two parts by a thinly silvered glass, one of the parts being reflected around between the plates in one direction by suitable stationary mirrors, while the unreflected beam is made to take an exactly opposite path. Hence when the disks are whirled, if the ether in the space is carried with the disks at all, the beam traveling opposite to this motion should be retarded, while the other beam is accelerated. This should produce a disturbance visible to the observer when the beams reunite. But when it was tried, there was no evidence at all of the slightest motion of the ether.

At first it seemed the Michelson and Morley experiment proved ether moves with matter, while on the other hand it seemed that Sir Oliver Lodge had proved just the contrary, that it does not move at all. Those who believe in the ether today advance strong arguments in support of Lodge, claiming that the ether moving through the Michelson and Morley apparatus produced a compensating effect in the apparatus itself which made the detection of the ether impossible.

Einstein has boldly ignored the ether and has thereby been enabled to formulate a more general law of gravitation than the classic law of Newton. On this as a basis he predicted that the gravitational field of the sun would bend the rays of light from the distant stars passing through it; and the British expedition announced that the photographs taken during the recent eclipse showed this to be true. This, however, does not prove there is no ether, and as Sir Oliver Lodge has said, perhaps the same phenomenon can be explained by means of the ether as well as without it.

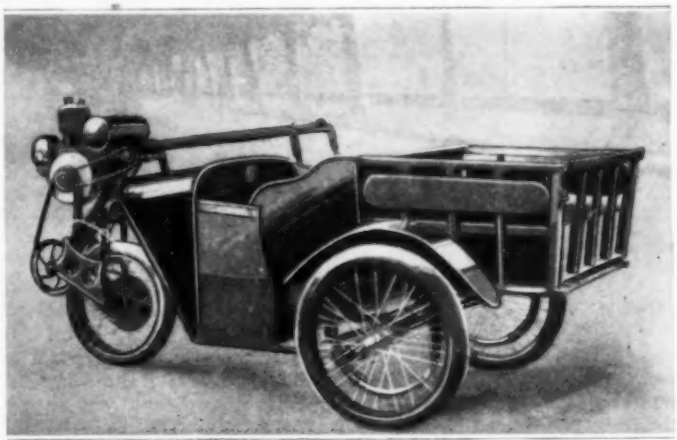
COPYRIGHT, UNDERWOOD & UNDERWOOD

STAGE FOR THEATER OF LAKESIDE HOTEL BUILT OVER WATER

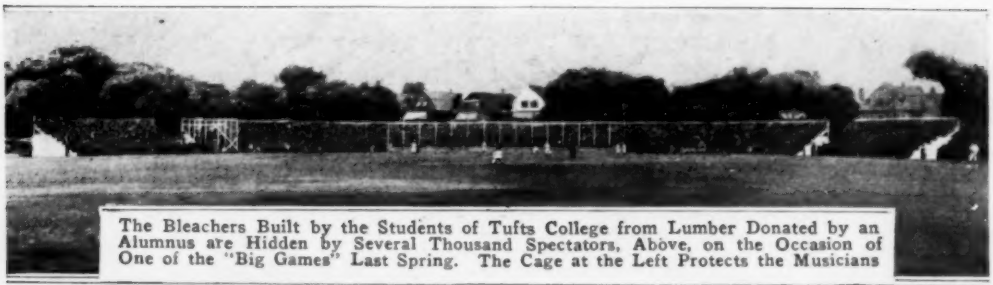
AN open-air theater with an auditorium on the land and the stage in Lake Michigan has recently been completed by a lakeside hotel of Chicago, Ill., for the entertainment of its guests. Seats for the audience have been placed upon the turf of the shore, that is, while the stage is formed of a platform set upon piling about 50 ft. out. Access is gained by means of a narrow gangway. The photograph above was snapped from the shore, and shows the stage as it nears completion. The orchestra "pit" will be observed below the footlights.

FOUR-HORSEPOWER MOTOR CAR HAS HANDLEBAR CONTROL

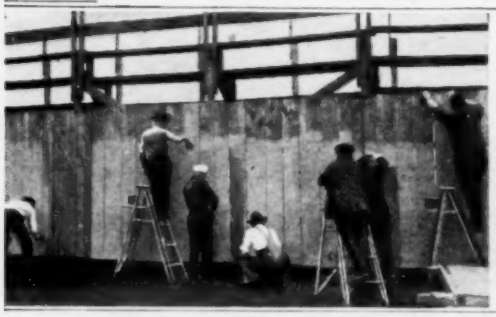
Light motor cars are growing lighter still in Europe. One now coming into popularity in Paris is driven by a one-cylinder, 4-hp. engine of 3.35-in. bore and 3.46-in. stroke, air-cooled, and mounted above the fork of the single front driving wheel. The car steers like a motorcycle, with a pair of handlebars, and is controlled by the same means. Lifting the bars actuates the clutch, by the simple process of loosening the tension of the belt drive. The right handle operates the front-wheel brake, and also carries the hand lubricating pump. The two rear wheels are equipped with brakes too, which are operated by a hand lever. Either a two-passenger torpedo body or a 550-lb. capacity delivery box may be fitted. The little engine is started by means of a hand crank.

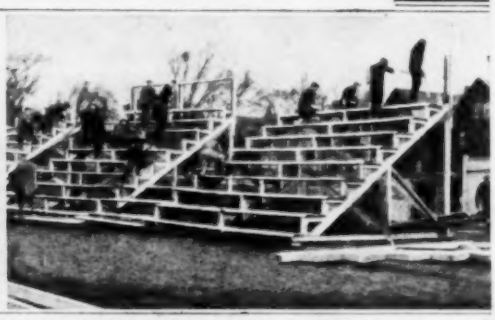


A Light Parisian Motor Car, with a One-Cylinder Air-Cooled Engine: The Handlebars Operate Steering Wheel, Brake, and Clutch



The Bleachers Built by the Students of Tufts College from Lumber Donated by an Alumnus are Hidden by Several Thousand Spectators, Above, on the Occasion of One of the "Big Games" Last Spring. The Cage at the Left Protects the Musicians





By Volunteering as Carpenters and Painters, the Students of Tufts College Saved the Administration a Bill for Labor of Almost $1,500. At the Right are Seen Two of the 20 Stands Built in Three and a Half Days. Paint is Being Applied to the Finished Structures, at the Left

VENTRILOQUIST INVENTS WALKING MANNIKIN

A ventriloquist known to American vaudeville audiences for many years has lately added considerably to the merit of his act by equipping himself with a walking mannikin, or dummy. It is a product of the performer's own ingenuity and skill. Unlike the ordinary mannikin, which is carried before the footlights with limbs dangling supinely, this little figure walks on and off the stage upon his own legs. His right hand is always held, however, by the ventriloquist's left, as in the palm are concealed the controls, by means of which the ventriloquist causes his "assistant" to walk, dance, and seat himself.

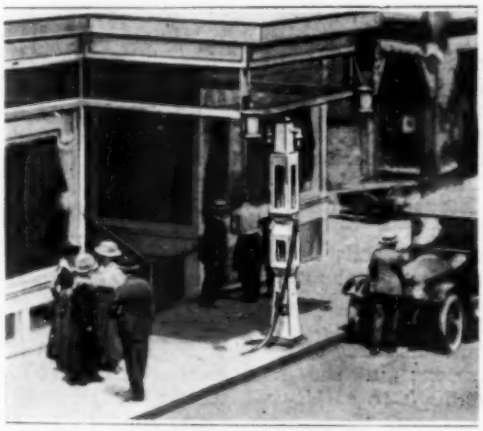
STUDENTS BUILD AND PAINT STANDS ON COLLEGE FIELD

Last spring, for the second time in recent years, an alumnus of Tufts College, Mass., donated lumber for the building of bleachers on the athletic field with the stipulation that the work be done by the students. This time, as before, the response to the call for volunteers was enthusiastic. Donning their oldest clothes, the boys worked with a will for a period of three and a half days, at the end of which 20 stands stood completed. In this work more than 30,000 ft. of lumber and eight kegs of nails and bolts were used. And now that the erection was accomplished, it was decided to give the structures a preservative coating of paint. Again the students volunteered, and in such number that the job was done in a single afternoon. Altogether, the students saved the college almost $1,500, according to a faculty estimate.

¶The commercial value of the information supplied by the Department of Agriculture has never been more strikingly exemplified than in the case of a cranberry grower of south central New Jersey. At the suggestion of the department, several years ago, he planted blackberries on 20 acres of soil so acid as to be considered valueless. Last year's crop brought almost $1,000 an acre.

GASOLINE-VENDING MACHINE OPERATED ELECTRICALLY

A gasoline and lubricant-vending machine, invented and now used by a garage man of New York State, is unusual in that, although stationed beside the street curbing in the usual way, it is operated electrically from the garage office. The apparatus consists of a rack, or stand, containing a fixed gasoline tank and a removable, spouted oil measure. Both are connected to the large tanks beneath the garage floor by feed pipes, the flow in which is regulated by means of switches in the office. If the motorist wishes five gallons of gasoline and two quarts of oil, for example, he steps into the office and pays for this amount. Without stirring from his seat, the proprietor turns one switch through five points and a second through two. Returning to his automobile at the curbing, the motorist finds his purchase awaiting him in the two containers. The gasoline he transfers to his car by means of a hose, the oil by means of the spouted measure itself.



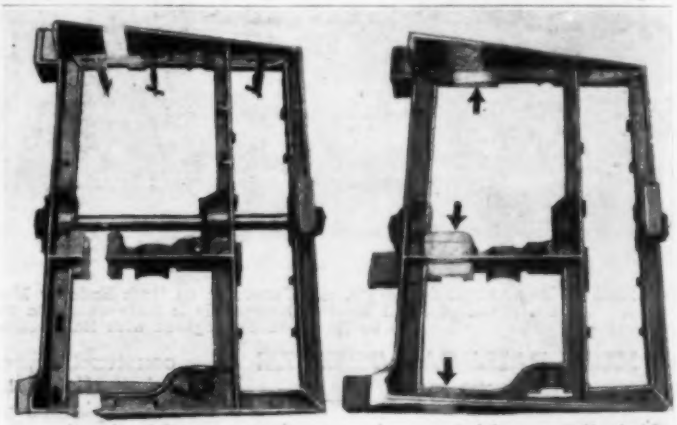
The Gasoline-Vending Machine at the Curb is Operated Electrically from the Office of the Garage

---

¶Its rudder disabled by a storm, the steamship "Vancouver" was navigated for the last 1,600 miles of the way from Bermuda to Queenstown, Ireland, recently, by means of its twin screws.

WELDING SAVES NEW CASTING FROM SCRAP HEAP

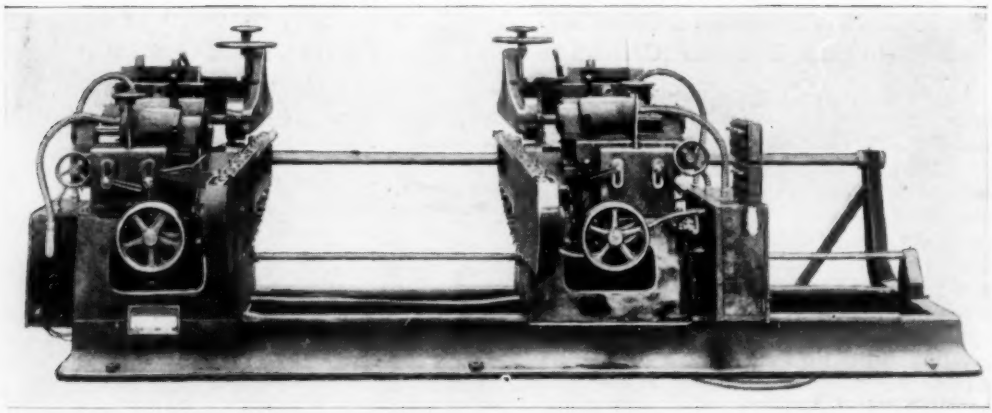
A welding job that is typical of the economies effected by the increasingly popular oxyacetylene process was performed some weeks ago in the factory of a large farm-tractor concern. An intricate aluminum frame pattern, worth $250, was found too narrow, it seems, after casting and finishing. As it was about to be scrapped, welding was thought of. The pattern was cut into two parts, which were then clamped so far apart that the pattern was of correct width. Aluminum was welded into the three gaps. The total cost of the operation, figuring in labor and supplies, was only about 75 dollars.



The Valuable and Intricate Aluminum Pattern is Seen at the Left as Cut into Two Parts. The Arrows at the Right Indicate Where Aluminum was Welded into the Three Gaps So Formed

WIRELESS MAY CARRY ACTOR'S VOICE TO GROUP OF THEATERS

An amazing prediction was made by a French expert on wireless telephony a few weeks ago in the course of an extended comment on the recent wireless "concert" given in Chelmsford, England, for the benefit of listeners in London, Paris, Berlin, Rome, and Christiania. By means of the wireless, he prophesied, music played by a single orchestra will be transmitted to not one but a group of motion-picture theaters. Similarly, a group of theaters will display the same film simultaneously while actors before one of the screens, suiting voice to action, will speak their parts into a transmitter. The scientist is presupposing an unbreakable film, apparently, and, still more important, some system for synchronizing the projecting machines.



This Machine Trims Stock to Length, and Tenons It on Both Ends by Means of Saws Mounted Directly on the Shafts of Small Electric Motors. It is Believed to Be the First of Its Type to be Equipped Throughout with Ball Bearings

HIGH RAILROAD TRESTLE BUILT IN ODD WAY

In building a high wooden trestle over an intersecting right of way, engineers of a western railroad recently adopted an interesting plan of construction. Or better, they were forced to adopt it because of the acuteness of the angle at which the tracks intersect. As seen from the above, the finished trestle takes the form of two rectangles, placed corner to corner, with the track running diagonally across them. This permits the use of more supporting uprights than usual.

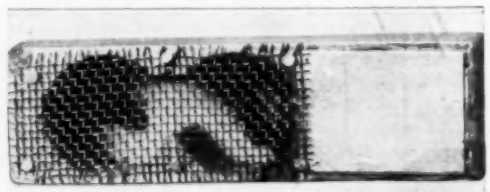
The Unusual Plan Design of This Trestle was Made Necessary by the Acuteness of the Angle at Which the Two Railroads Intersect

NEW DOUBLE-END TENONER NOW PRODUCED

A new woodworking machine now being sold is designed to trim stock to length, tenon it on both ends, and accomplish cope work, all in one operation. Because of this performance it is being installed in furniture, sash-and-door, and automobile factories. It is of duplex construction, one unit being fixed, the other sliding along the long base. The four spindles mounted on these are each 2 in. in diameter, and are driven direct by 3-hp. induction motors, each controlled independently. The coping-saw arbors can be tilted to an angle of 22°, and are provided with 2-in. vertical and 4-in. horizontal adjustments. The machine is equipped throughout with ball bearings.

ITALIAN QUEEN BEES TRAVEL BY MAIL TO ENGLAND

In little wooden boxes, each composed of a tiny cage and a tinier provision chamber, thousands of bees have traveled from Italy to England recently through the mails. Responsibility for the curious pilgrimage rests with the British ministry of agriculture which has learned that certain queen bees of Italy are highly resistant to a disease of disastrous prevalence among English bee colonies. The ministry sells the queen to the beekeeper at a nominal price, accordingly, then orders it sent directly to the purchaser from Italy. Here 12 drones are placed in each box as traveling companions for the queen; in the larder is packed food enough to satisfy all during the journey.



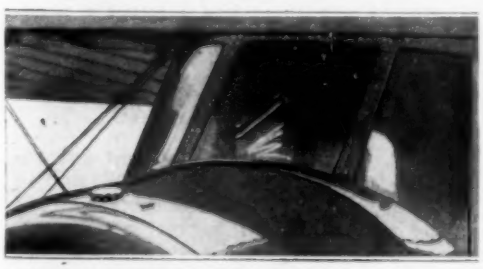
In This Little Wooden Box, Half Cage Half Larder, the Queen Bee is Mailed from Italy to England. A Dozen Drones Accompany Her

NEW HERD OF WILD BUFFALOES FOUND IN YELLOWSTONE PARK

That the wild buffalo herd of Yellowstone National Park is not dwindling, as is supposed, but on the contrary is expanding rapidly, was proved recently by the discovery in the southeast section of about 15 animals. The wild buffalo is never seen by tourists, and only rarely by the rangers in their patrols of the remote areas. Yet their number can be estimated closely. A few years ago, by an official estimate, there were about 50; this latest find brings the number to approximately 100. The little herd was found within five miles of a large hotel, evidently lured down from its mountain haunts by the abundance of spring grass on the bottom lands. In speaking of the wild bison, it is worth mentioning also that the tame herd of the park has been augmented this year, by almost 50 births, to a population of 500 or more. Many of these are on display this season.

WINDSHIELD CLEANER ASSURES CLEAR VISION FOR FLIERS

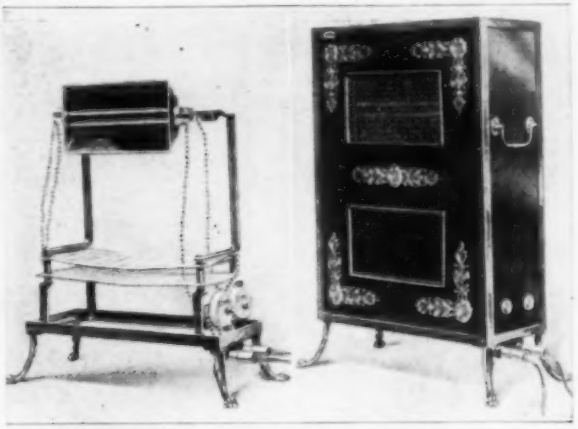
Autoists have some idea of weather probabilities when they start on a trip, but fliers who range wide are likely to run into rain, or even snow, at any time without warning. Preparation for such an occasion is simple, involving merely the mounting of a cleaning device on the windshield to assure the maintenance of clear vision. A cleaner of this kind, mounted on a pivot at the center of the windshield and easily rotated from within, was part of the regular equipment on an "aerial coupé" displayed at a recent exhibition. The cabin of this machine holds two or three passengers and a pilot.



A Windshield Cleaner of Automobile Type is Fitted to the Middle Panel of the Window of This "Aerial Coupé"

ELECTRIC STOVE OF NEW TYPE MARKETED IN FRANCE

An electric stove of unusual design is now being marketed in France. Within the exterior, which is a metal box with no bottom and with a rectangular window in front, are four heating elements. Two of these are broad strips of fabric into which have been woven many resistance wires. These strips, placed immediately above the bottom of the box, warm the rising air thoroughly. The air is heated further, before it passes out of the rectangular window and into the room, by two glass-inclosed elements in front of a reflector. These become visible through a grating of the window as they warm to a red heat, and so serve to improve the appearance of the stove.



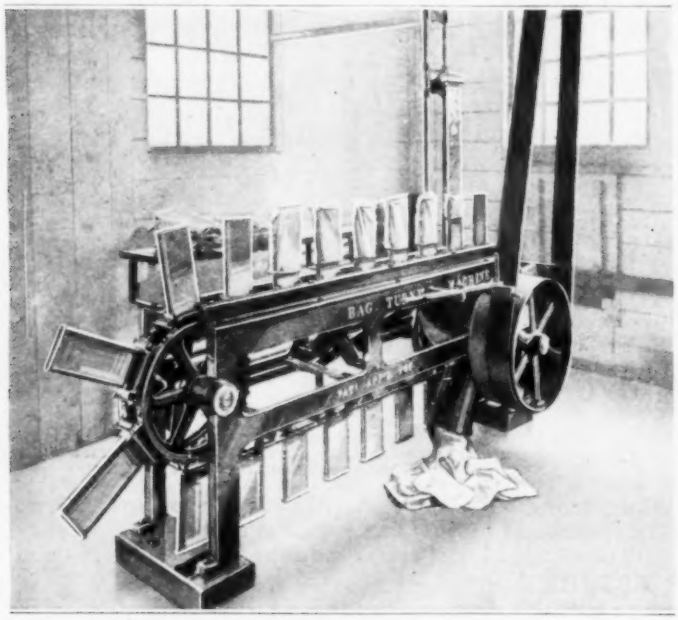
The Cover of the New Electric Stove, at the Right, has been Removed, at the Left, to Show the Heating Elements. The Fabric Strips are Seen above the Switch

EXCESS OF CEMENT USED WITH WET AGGREGATE

Experiments with the mixing of concrete, recently completed by the Bureau of Standards, show that when aggregates are proportioned by volume, as is usually done in mixing concrete, the use of wet sand requires one half to one bag more of cement per cubic yard of concrete than does the use of dry sand. Or, the use of sand from a dry pile will result in the employment of less cement for a given volume of concrete than would the use of sand from a pile that has just been wet by the rain. If the sand is moister than usual, accordingly, it is advisable to use a proportionately larger volume in mixing the batch.

MACHINE TURNS 2,500 BAGS INSIDE OUT IN HOUR

The statement that a new, one-man machine can turn 2,500 burlap or cotton bags inside out in an hour is appreciated for its real value when it becomes known that the turning of the finished bag is one of the most costly operations in the making of bags, and that an expert operator working by hand can handle only about 600 an hour. The machine is built around a conveyor chain, to which are fixed 22 vertical metal frames. On these the operator slips the bags as they come to him from the sewing room, wrong side out. Driven by a motor through an interrupter gearing, the conveyor proceeds intermittently, or haltingly. At each halt a vertical plunger descends into one of the frames, carrying the bag along and so turning it. The plunger then rises, the conveyor jerks forward, and the turned bag is pushed out upon the floor.



This Machine Turns Bags Inside Out at the Rate of 2,500 an Hour. The Turning is Done by the Plunger at the Right Which Descends as the Endless Conveyor Halts Momentarily

---

The housewife should not use "canning powders" in putting up fruits and vegetables, the Department of Agriculture warns. The excessive consumption of boric, salicylic, and other preservative acids, sold under fanciful names, may be attended by severe effects upon the health of the family.

PRODUCTION OF MAGNESIUM NOT CONTINUED AFTER WAR

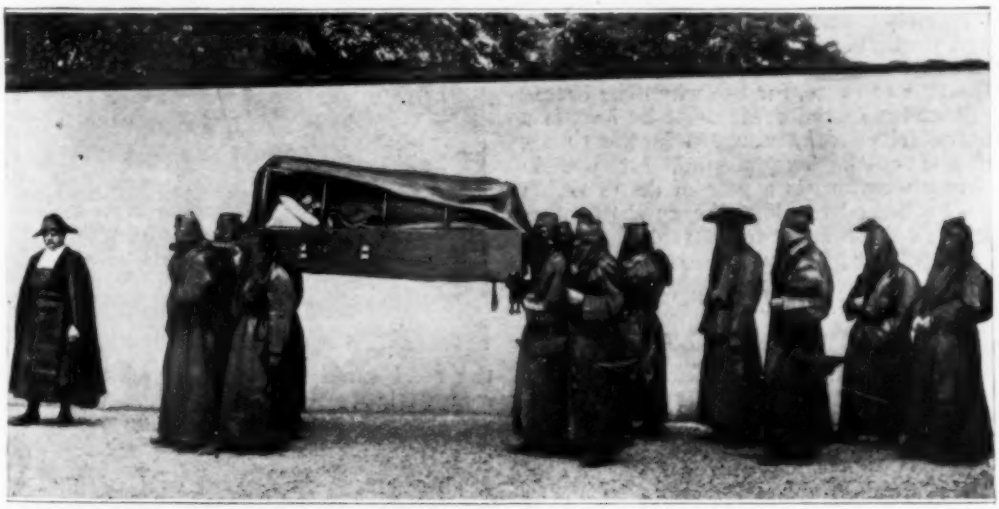
Though war-time experience made common knowledge the fact that the tensile strength of cast magnesium is higher than that of aluminum, and that the former metal weighs approximately 32 per cent less than the latter, American demand in 1919 fell close to pre-war status. In 1914, according to a recent bulletin of the Bureau of Mines, almost no metallic magnesium was made in this country, and there were imported only 35,817 lb. In the next year importations from Germany were cut off, and manufacture began in this country on a large scale. In 1917 war demands forced the domestic output to 115,813 lb., and in 1918 to 284,188 lb. Then, with the signing of the armistice, production declined, until in the fall of 1919 only one American firm was making the metal. In the interests of American economic independence it is hoped, however, that as automobile and airplane manufacturers are taught its merits, the manufacture of this unexploited metal will again rank as an important American industry.

NEW OIL-RECOVERY PROCESS USES ELECTROLYTIC ACTION

A new, patented method of oil extraction has recently been discovered, and is now being developed and commercialized for the production of vegetable and animal oils of all sorts, as from peanuts, cottonseed, copra, linseed, olives, whale blubber, fish livers, etc. The fat-bearing substance is simply fed, in a raw state, into a machine containing an electrolytic unit. Here, in less than a minute's time, the electrolytic action breaks down the fat cells and releases the oil content. Thence the rendered material passes to a separating device. The process is new fundamentally, and also in that it is odorless, continuous, automatic, cheap, and so efficient that practically 100 per cent of the oil is obtained. Necessary current can be supplied by a small generating set.

SEATTLE AUTOMOBILES LINE UP AT DAYBREAK FOR GASOLINE

DURING the period of the gasoline shortage "First come, first served" has become the rule at the automobile-service stations of Seattle, Wash. In consequence, as the stations usually secure their supplies early in the morning, most motorists are up with the sun each day. Arriving at their stations they are almost invariably compelled to wait their turn, with the result that the lines often reach, as in the photograph, the length of a block or more. In spite of the ruling that each pleasure car can be served with no more than five gallons, the stations are usually bone-dry before noon.

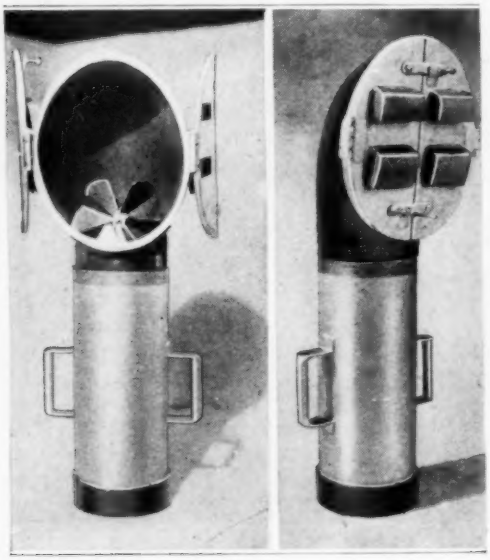


MASKED MONKS CARRY SICK BROTHER TO HOSPITAL

A VARIETY of ancient practices and traditions are sedulously preserved in the historic city of Florence, Italy, by patriotic, historical, and similar organizations. The local religious bodies are most conspicuous, perhaps, for this clinging to queer customs, one of which is the subject of the above photograph. Having been notified that one of their number is afflicted with a contagious disease, the members of the order have donned robes and hoods, and are now carrying the sick man to the isolation hospital. The black covering of the stretcher is withdrawn for an instant at the request of the photographer.

IMPROVED SHIP'S VENTILATOR FUNCTIONS IN ALL WEATHER

A ship's ventilator of recent invention is noteworthy in that it delivers air to the hold or cabin which it serves, in a



The Fan of the New Ship's Ventilator is Seen at the Left, Mounted in the Throat of the Cowl. The Doors Have Been Closed, at the Right

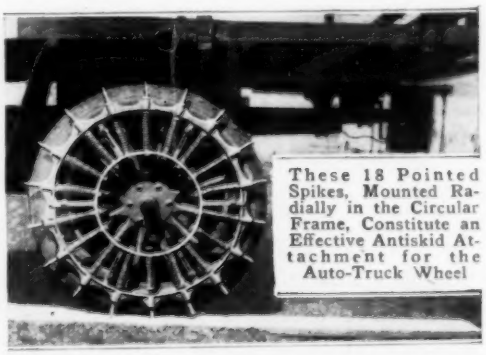
dead calm, and in that it can safely be operated while heavy seas are breaking over the vessel. Though from a distance it resembles an ordinary rotatable, cowl-type ventilator, it is seen on closer inspection to be equipped with two accessories. The first of these, for use when the breeze fails and a forced draft must be had, is a motor-driven fan, mounted in the throat of the cowl. The second, for use in stormy weather, is a pair of doors which can be locked to close the cowl opening. In each door are two rectangular openings protected by small hoods against the intrusion of sea water.

CITY MUSEUM TO GET QUAINT SCULPTURAL MINIATURES

The announcement that the Cleveland Museum of Art is planning a series of historical and geographical "groups" to be executed by an artist of New York City, reminds that for five years, now, this man has been perfecting a form of artistic expression that is almost entirely his own. He concerns himself, in plain, with the making of tiny, three-dimensional pictures of historical, geographical, and romantic interest. They are composed, first, of a miniature stage, or setting, which is correctly furnished in every detail. On this stage are placed wax figures, about eight inches tall, and garbed in the clothes of the place and period. Artistic lights and a gauze screen across the front of the stage heighten the illusion of reality, and complete the "picture." The artist was formerly a naturalist in a metropolitan museum of natural history, it may be explained, and there was charged with the making of the familiar groups of wild animals and exotic peoples.

SHARP SPIKES ON AUTO WHEEL ARE ANTISKID ATTACHMENT

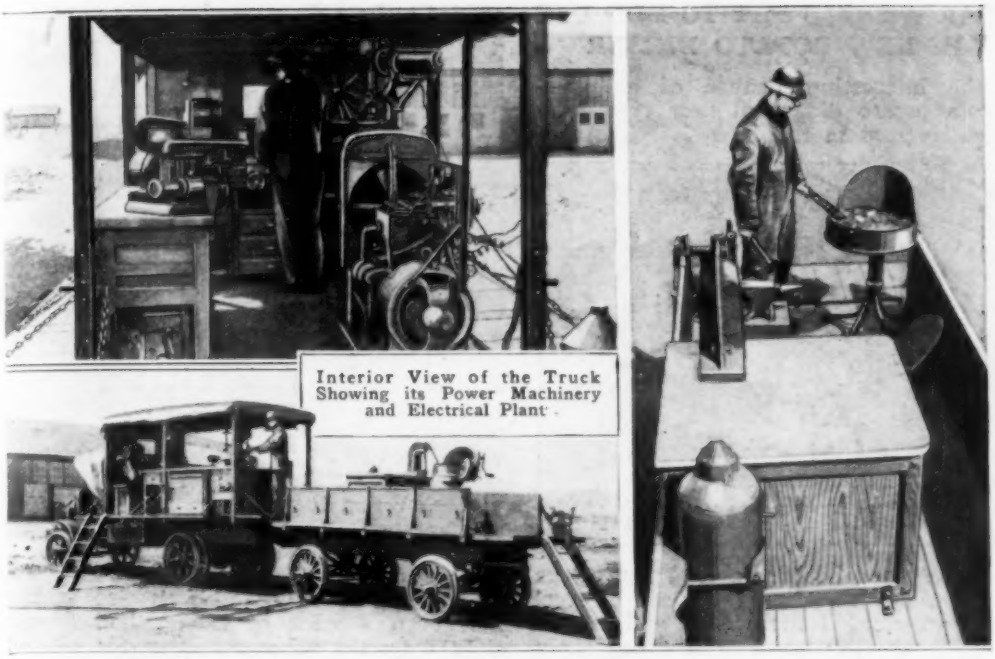
A new antiskid attachment for automobile trucks is intended for use on frozen and inclined surfaces, and in soft mud. Functioning under such conditions, the equipment holds the truck to its path as his iron-shod stick sustains the Alpine climber on the most slippery ice. As clamped to the outside of each wheel, the attachment consists of two concentric rings of steel, the outer of a little more than the diameter of the wheel rim. Piercing these rings radially are the 18 heavy, pointed spikes, or prongs, which by the weight of the truck are forced into the highway. They are not mounted immovably, however, but in coil springs, which permit a limited recession from



These 18 Pointed Spikes, Mounted Radially in the Circular Frame, Constitute an Effective Antiskid Attachment for the Auto-Truck Wheel

the road surface. The pointed ends are removable in order that they may be replaced when dull or worn away.

¶ The heretofore unused part of its lot is now yielding a considerable revenue to a church in a small eastern city. Surfaced with cinders, the area is rented as parking space when, on Sundays and holidays, the farmers flock to town in their automobiles.



Interior View of the Truck Showing its Power Machinery and Electrical Plant

Left: The Complete Mobile Repair Shop as It Appears in Action. Note the Removable Stepladders for Speeding Up the Activities of the Workmen. Right: The Forge, and Welding and Brazing Outfit of the Trailer

TRAVELING REPAIR SHOP KEEPS PLANES FIT

A new perambulating airplane-repair shop, which is claimed to be the most elaborate and complete of its kind, was recently put into service by the War Department at Rockwell Field, Calif. The entire outfit, which weighs 32,000 lb. and cost $25,000, is carried on an enormous motor truck and trailer. In addition to all the tool equipment included in former outfits, the new repair shop embodies several noteworthy and heretofore unattempted features.

The truck houses a lathe and combination horizontal boring machine, drill press, power hacksaws, emery wheels, buffing machine, and punch press. There is a set of tools including everything needed for rebuilding an airplane in the field, and the electrical equipment. A four-cylinder, four-cycle stationary engine in the truck body drives a generator, which in turn charges a set of storage batteries located under the floor. In addition to supplying power for the machinery, this outfit also provides current for a spot-welding device, and a lighting system that may be set up to illuminate an entire aviation field. Night landing of airplanes is thus made possible. In the trailer is a complete welding and brazing equipment, and a forge, in addition to tools for any kind of a blacksmithing job. The truck also includes an air compressor which is used for inflating airplane tires, for transferring gasoline and oil, and for spraying distillate for cleaning airplane machinery.

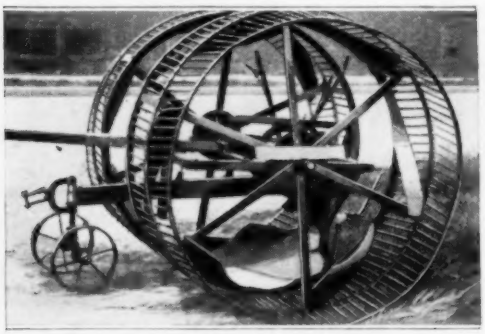
The equipment has, besides, a portable radio telephone having an operating radius of 150 miles, which enables the mobile repair shop to keep in constant communication with planes in the air, and most of the time with its original operating base.

RED CROSS ADOPTS STANDARD EMERGENCY SURGICAL PACK

For use in great disasters and emergencies the American Red Cross has lately adopted a standard surgical package. It is of about the size of a small loaf of bread, is wrapped in heavy, paraffined brown paper, and contains 10 gauze compresses, one absorbent pad, one rolled wadding bandage, one muslin bandage, one gauze bandage, one triangular bandage, and safety pins. Samples with instructions for preparation are being sent to Red Cross workrooms throughout the country. The move has been fully indorsed, incidentally, by the surgeon-general of the army.

REAR WHEELS PUT TO ODD USE IN NEW POTATO DIGGER

The interesting feature of a horse-drawn potato digger of new type, now manufactured in the East, is the use of

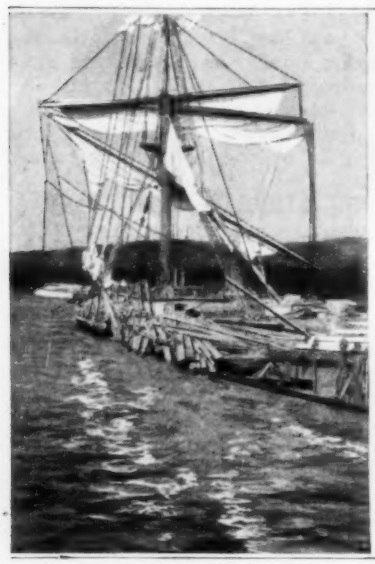


Thrown by the Plowshare into the Wheels of This Potato Digger, the Soil Falls Through, and the Potatoes Tumble into the Furrow between the Wheels

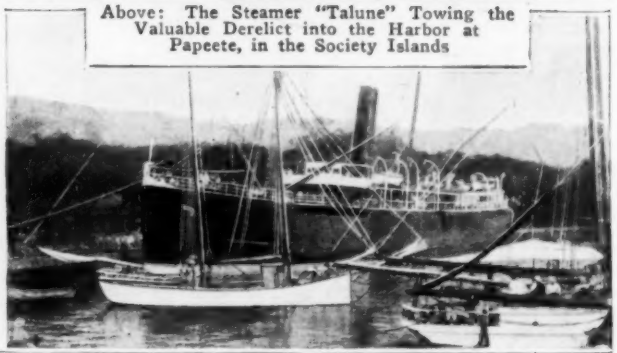
the two rear wheels as a vital part of the mechanism. The rims are made of steel bars arranged transversely, and consequently resemble great squirrel cages, six feet in diameter. Slanting across the inner surface of each of these cagelike wheel rims are six metal plates. Between the wheels is a large, reversible plowshare. As the team draws the digger down the rows of hillocks, the plowshare throws potatoes and soil into one or the other of the wheels. The dirt falls through the cagelike rim; the potatoes, having been carried a short distance along the revolving wheel, fall back, and are deflected by the diagonal plates into the furrow plowed up a minute before.

LOST LUMBER VESSEL BRINGS FORTUNE TO FINDERS

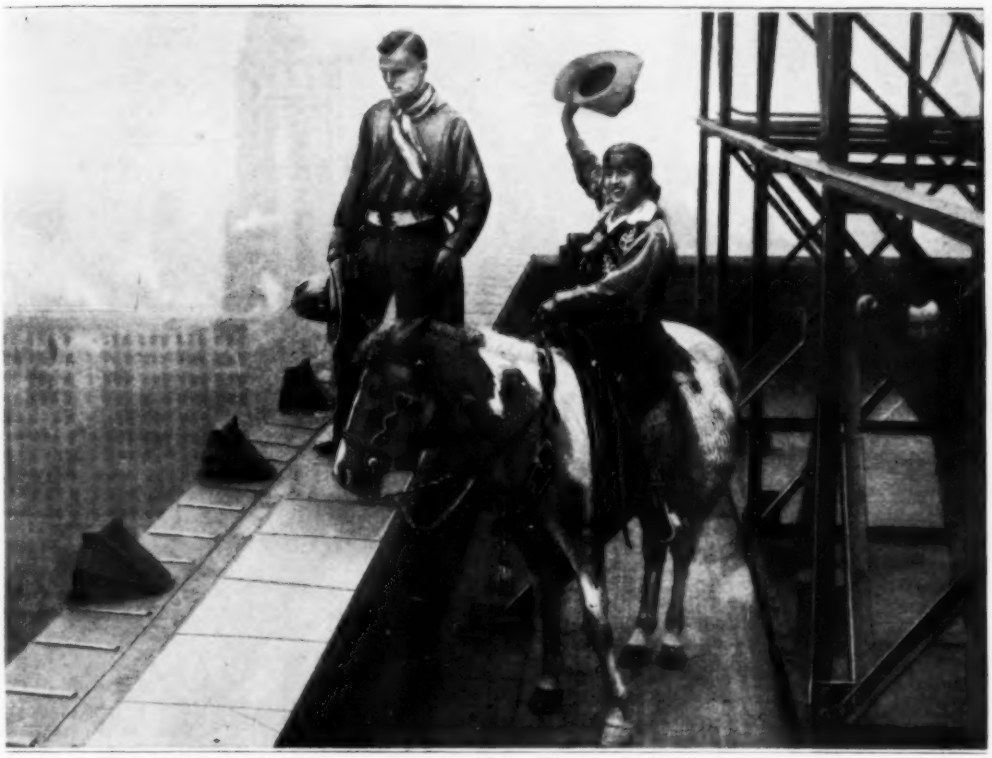
There is always supposed to be one more voyage left in an old ship. So the 547-ton sailing vessel "Retriever," built in 1881, left San Francisco late last February in spite of its bad condition, with an unsinkable cargo of mine lumber for Peru. But it never reached its destination. By the time it had crossed the line, water was gaining rapidly in the hold, and 150 miles east of Marquesas Islands the crew was forced to abandon it and take to the small boats for three exhausting days and nights. When they told their story later at Papeete, in the Society Islands, most of the foot-loose shipping in the harbor set out to scour the South Pacific for the prize derelict. The quest proved vain. Not even a stick of timber had been sighted by the volunteer salvagers when the steamer "Talune," bound on business from New Zealand to Papeete with no thought of derelicts, came abreast of Huaheine Island, in the very midst of the Society group itself. There the old lumber ship was floating peacefully, its decks awash, but its $75,000 cargo as good as ever, and on May 17 the steamer towed it triumphantly into harbor.



Above: The Steamer "Talune" Towing the Valuable Derelict into the Harbor at Papeete, in the Society Islands



These Photographs were Snapped in the Harbor at Papeete a Few Days after the Arrival of the Steamer with Its Find. At the Left, Piles of Lumber are to be Seen on the Deck of the "Retriever." At the Right Is the "Talune"

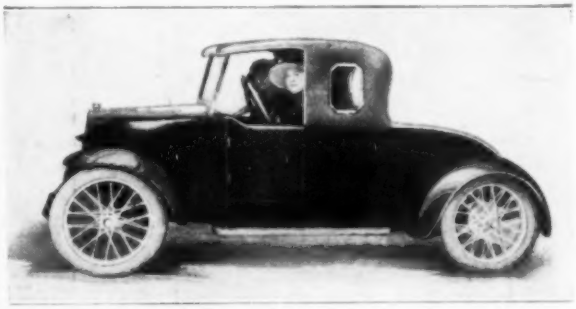


COWGIRL ON PINTO HORSE GREETS NEW YORK FROM HOTEL ROOF

ASTRIDE their piebald ponies, and wearing sombreros, audible shirts, and fleecy chaps as the vestments of a vanishing type, there rode into New York City recently a man and a girl from the West. Reaching their hotel, famed as one of the most luxurious in the world, they rode up the steps, into the lobby, and to the desk. Here they registered, and the curious crowd learned that both hailed from Wyoming, and that the girl bore letters from the governor inviting prominent men and women of the East to the forthcoming annual celebration at Cheyenne. The intrepid girl then rode her pony, via the elevator, to the roof, where horse and rider gave Manhattan the imperturbable "once over."

MOTOR IN REAR OF NEWEST MIDGET AUTOMOBILE

Several departures from current practice feature a little automobile recently constructed by an American manufacturer, and soon, it is hoped, to be produced in quantity. It is called a "unit car," first of all, because the power plant is mounted as a unit just above and forward of the rear axle. Universal joints and other complexities of transmission are made unnecessary by this arrangement. The motor is of four-cylinder, air-cooled type, and develops 16 hp. The space beneath the hood, ordinarily occupied by the engine, is given over to the gasoline tank, to a luggage compartment, and in the rear, to leg room for the occupants. The four wheels, of airplane type, are each surmounted by an individual mudguard, which, in front, turns with the wheel. On the front fenders, too, are fixed the headlights, which are thus enabled to illuminate curves in the road. The car is operated in the usual way.



The Motor of This Newest Midget Automobile is Mounted Immediately in Front of the Rear Axle. Beneath the Hood, in Front, Are the Gasoline Tank and a Luggage Compartment

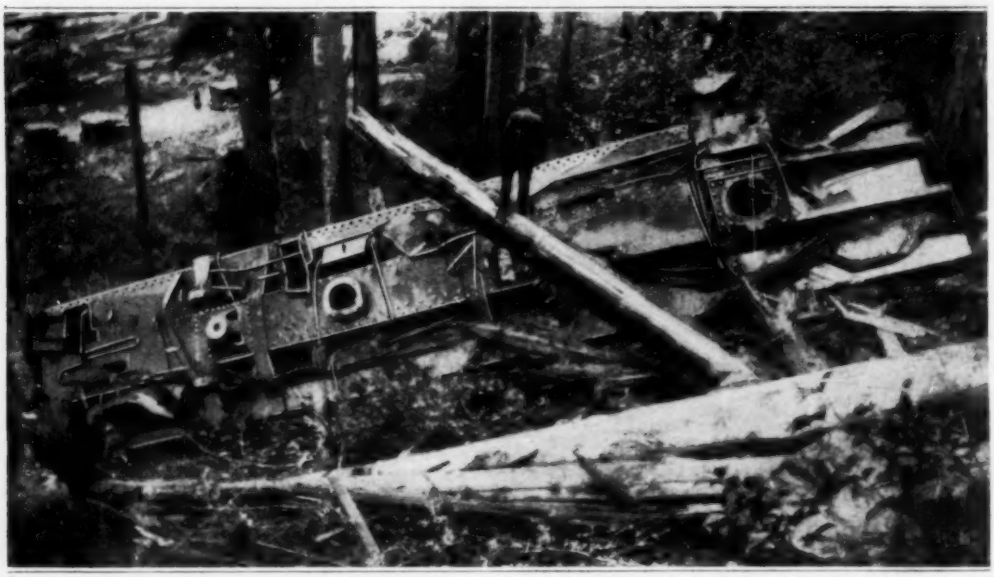
HINGED LEGS PERMIT STAIR CLIMBING WITH HAND TRUCK

A stair-climbing hand truck is a recent invention which should prove itself valuable wherever heavy trunks and similar objects must occasionally be moved up and downstairs. The gist of the invention is a pair of wooden legs, which are hinged to the middle of the frame of a rather ordinary hand truck. These are held in normal position by two rods which are connected, through coil springs, to the front of the truck. As the truck is pushed upstairs, the legs serve as fulcrums, permitting the operator to lift the front end of the truck and push it forward to the next step. Then, with the wheels as fulcrums, the operator lifts the rear end, and so permits the coil springs to pull the two legs forward to the next step. This operation is repeated to gain each step.

Two Wooden Legs, Hinged to the Middle of the Frame of This Hand Truck, Serve as Fulcrums, and So Make Stair Climbing Easy

GIANT ELECTRIC LOCOMOTIVES PLUNGE DOWN MOUNTAIN

As spectacular a wreck as the history of railroading has produced occurred a short time ago, when two of the giant new electric locomotives just put into service on a western line plunged down the timbered steeps of the Cascade Range in a drop of 300 ft. The collapse of a 40-ft. stone retaining wall a short distance west of the divide, supposedly caused by the undermining action of heavy rains, literally projected the big engines into space. The great masses of steel turned over perhaps 20 times in their crashing roll down the mountain, brushing bowlders aside and clipping off forest trees in their path like weeds. The most remarkable feature of the accident is that none of the six men in the crews was killed, though five were hurt, two rather badly. Had steam been the motive power, it is thought scarcely possible that any could have escaped. The estimated damage to the locomotives is between $50,000 and $75,000. They were valued, incidentally, at $175,000 each.



The Wreck of One of the Two Huge Electric Locomotives after Their Plunge down 300 Feet of Precipitous Hillside: The Steel Giants Rolled Over and Over, Pushing Bowlders Aside and Clipping Trees like Weeds

The New Rein-Driven Tractor is Handled Exactly like a Horse. By Means of Differential Brakes, Either Drivewheel can be Retarded or Stopped by a Pull on the Corresponding Rein. A Pull on Both Reins Stops or Reverses the Machine

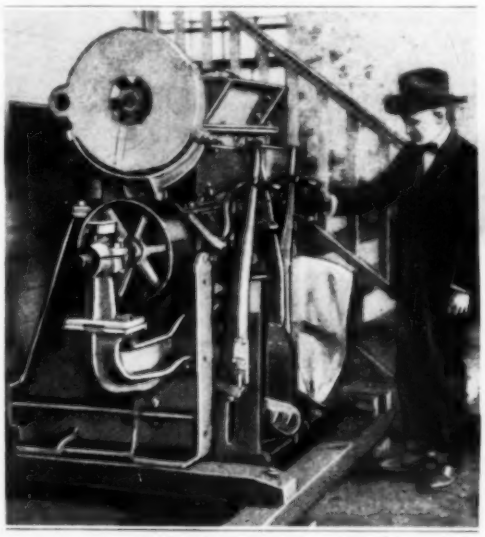
ONE-MAN TRACTOR IS DRIVEN BY PAIR OF REINS

Further improvement in the rein-driven type of farm tractor is announced by a Wisconsin manufacturer, who is producing a machine entirely controlled by two reins, and handled exactly like a horse. Having a 12-hp. kerosene engine, and giving a 1,000-lb. pull at the drawbar, it will do the work of five horses, controlled from the seat of any of the usual horse-drawn implements, or a wagon. By means of differential brakes, either drivewheel may be retarded or stopped by a pull on the corresponding rein, and the tractor turned in its own length, while pulling on both reins either stops or reverses the machine.

An automatic governor adjusts the speed to the work, from 1½ miles an hour in the field to three miles on the road. A 30-in. clearance permits cultivation of row crops, and a 10-in. pulley is provided for belt work. The whole machine weighs 2,350 lb., and is 10 ft. long.

CEMENT BAGS OF VALVE TYPE FILLED BY SPECIAL MACHINE

Cement, lime, and similar materials, are now commonly packed at the producing plant into bags of the valve type—bags filled through a corner of the bottom, that is, then turned right side up to close the aperture. Containers of this type are not filled by hand, but are stuffed to capacity, quickly and without waste, by a special machine. Driven by a gasoline engine or small electric motor, this machine fills the bags from an overhead hopper.



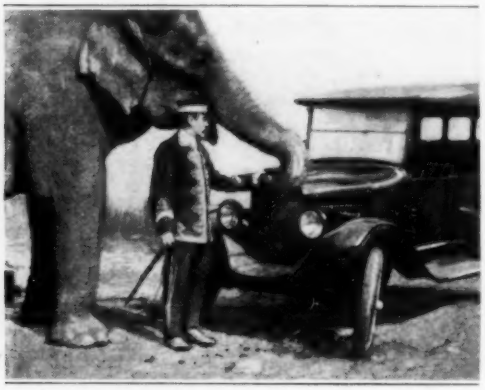
One of the Valve-Type Cement Bags has been Placed beneath the Spout of the Special Motor-Driven Filling Machine

then releases them, as various handles are manipulated by the operator.

¶German war-time experiments with the use of blast-furnace slag in the manufacture of brick have lately borne fruit in an apparently successful method. It involves the use of "foam" slag, formed by the contact of molten slag and water.

ELEPHANT LEARNS TO FILL AUTOMOBILE RADIATORS

"Big Bill," largest of the elephants carried with a famous circus organization, has lately developed a talent which should win the admiration of every manager of an automobile service station. For "Big Bill" has learned to fill auto radiators with such dispatch that the cars operated by the circus officials are now brought to him for refilling. With his trunk in a barrel of water, the animal fills the two capacious air passages. A graceful flourish then brings the proboscis to the radiator filling port, into which the water is discharged.



Discharging the Water Held in the Air Passages of His Trunk, the Elephant Fills the Radiator in Record Time

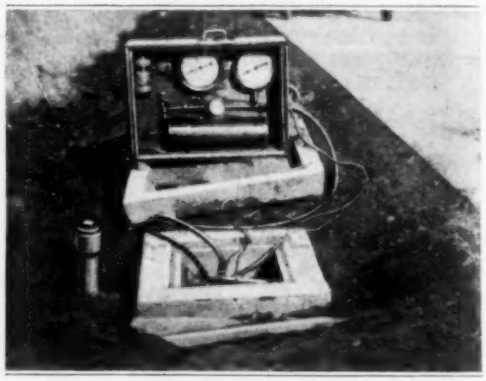
METAL EYES FIXED TO LOGS FOR JOURNEY DOWNSTREAM

Story writers who tell of the timber country never tire of describing the lumberjack's agility in leaping from log to log as the big sticks spin and tumble in the swollen river. Unfortunately, the logs now sent downstream by one western concern neither spin nor tumble. Instead, each is part of a raft consisting of from 10 to 20 logs. These rafts are made up by simply driving a spike, with eyelet head, into each log, then threading a chain through the eyes. Bound together in this way, the floating logs are handled with less difficulty than before.

As a Chain is Threaded through the Iron Rings, the Logs are Easily Made Up into Rafts of Any Size Desired

TEST BEHAVIOR OF SOFT SOIL UNDER HARD PAVEMENTS

With the increasing use of heavy motor trucks on interurban highways, it is becoming evident that the nature and behavior of the soil under a pavement may be as important a factor as the paving material itself. That road-engineering knowledge of these conditions may be more definite, a government bureau is conducting a series of tests on a well-traveled concrete road in Virginia. The instrument used has a sensitive contact member located between the pavement and the underlying soil, connected to measuring apparatus in a box alongside the road. The deflections and bending of the road crust under truck vibration and impact, as affected by different subsoils, are expected to furnish new data for future road design.



Instrument for Measuring the Deflection of Pavements, as Affected by the Underlying Soil. It is Expected to Furnish New Data for Future Road Design

HUGE POWER DEVELOPMENT PLANNED BY FRENCH

A water-power development now contemplated by the French will rank, when completed, according to recent announcement, with the pyramids of Egypt, the roads of Rome, and the Panama Canal.

Hard pressed for coal, the government intends to harness the swift mountain streams of southwestern France, in fact, and so electrify the industries in all the cities of this important area. The approved plans call for not one but a series of dams. The first will be 283 ft. high, and will block the Chavanon River, in the upper Dordogne region. The turbines will be installed at the village of La Cellette, and will develop 4,500 kw. Leaving the wheels at this village, the water will enter a huge pipe, and will drop downstream for five miles to another turbine, developing another 5,100 kw. A second dam, even higher now than the Croton Dam in New York State, will next be built below the confluence of the Chavanon and the Dordogne. Here the turbines will develop 26,000 kw. The largest dam of all, at last, will be built 15 miles farther downstream, at Chambon. This structure will rise 407 ft. or more than 150 ft. higher than the famous Roosevelt dam in Arizona, and will furnish 100,000 kw. As the water backs up behind these three dams it will swallow up village after village in valley and ravine.

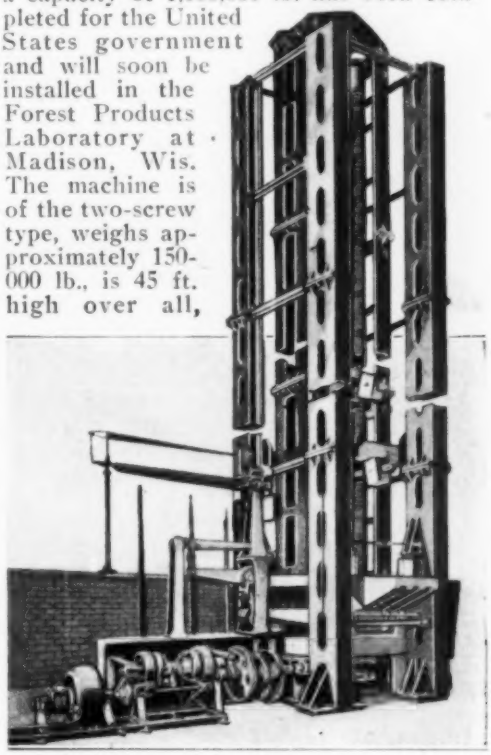
SEAT OF BABY CARRIAGE IS TRANSFERABLE TO BICYCLE

From a little village in far-away Siam a reader of this magazine has sent for publication a description of an interesting baby-carriage seat of his own invention and manufacture. The seat is simple in construction, yet it is so ingeniously contrived that it can be lifted out of the baby-carriage body, and hooked securely to the handlebars of a bicycle. In this position it rests upon the horizontal member of the bicycle frame. The seat can be transferred from carriage to bicycle without disturbing the baby.

Without Disturbing the Baby, the Seat of the Carriage can be Transferred to the Bicycle, as Pictured at the Right

FOREST PRODUCTS LABORATORY TO GET BIG TESTING MACHINE

A vertical screw-testing machine having a capacity of 1,000,000 lb. has been completed for the United States government and will soon be installed in the Forest Products Laboratory at Madison, Wis. The machine is of the two-screw type, weighs approximately 150,000 lb., is 45 ft. high over all, and stands 37 ft. above the floor when the table top is level with the floor. For compression, it will test columns 30 ft. long or less, and for testing in transverse will accommodate specimens 10 ft. long or less. When arranged for tensile tests the maximum travel of the pulling head is 29 ft. The weighing beam is of the micrometer-dial screw type, and reads from 4 to 100 pounds.



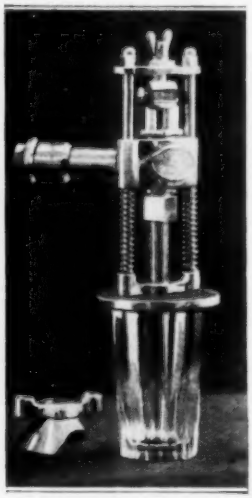
This Screw-Type Testing Machine, Built for the Forest Products Laboratory, Is Capable of Exerting a Pressure of 1,000,000 Pounds on a Column Placed beneath the Moving Head

AUTOS OF STAINLESS STEEL PROPOSED FOR TROPICS

To the new uses of the stainless steel now made at Sheffield, England, and at other steel centers, the American consul at that city suggests that there be added the manufacture of automobile parts. He feels that the automobile market of the humid tropics and the Far East will be captured by the first firm to build its cars of this noncorroding material.

TAP REGISTERS EACH DRINK TAKEN FROM BARREL

An elaborate self-registering tap for the cider barrel, or similar container, has been invented by an Australian, and is now in use in the beverage dispensaries of that continent. The apparatus is made of metal, and can be screwed into any wooden barrel or tub. The valve is operated by simply pressing the bottle or tumbler upward against a horizontal plate, in a manner familiar to patrons of the larger American cafeterias. When the bottle or tumbler is filled, pressure is released and the flow stops. Fixed above the valve is a counting mechanism which is operated every time the valve is opened.

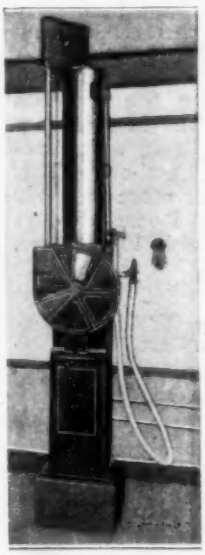


MINIATURE MODEL REPRODUCES SHIPYARD IN ALL DETAILS

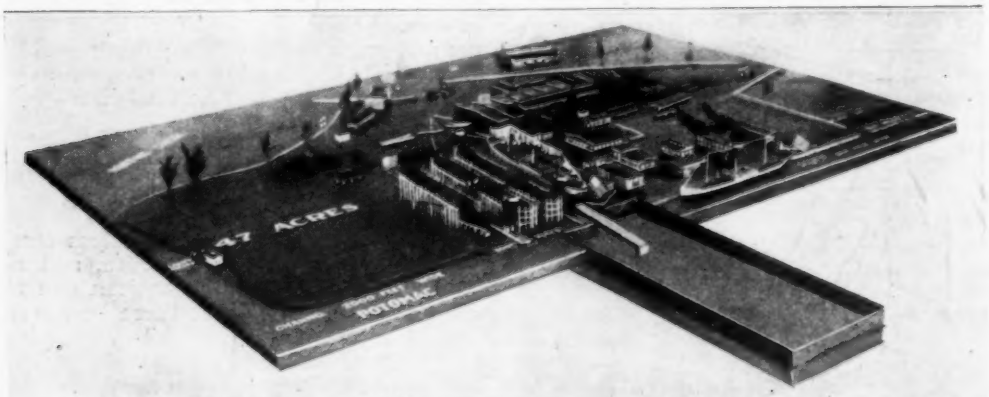
Lilliputian shipbuilders, if such there were, would take keen delight in a model shipyard recently constructed in complete miniature reproduction of a big one on the Potomac River. At the foot of the tiny ways is a basin of real water, and when a lever is pulled, a toy vessel slides down in an actual launching scene. On other stocks, in various stages of construction, are three more ships, showing the process of building in all its details. Not only the shop and administration buildings, but the lighthouse, hospital, employes' café, and baseball grounds of the large yard are all repeated in the small one. Steaming up the river is seen a fully-rigged ocean freighter.

NEW GASOLINE PUMP RECORDS PRICE OF WHOLE ORDER

The man in the auto does not have to make a lightning calculation every time he has the tank filled, when the garage is equipped with a type of computing gasoline pump just placed on the market. Instead of pumping a gallon at a stroke, necessitating counting the strokes, the new accessory registers the quantity extracted continuously on a visible gauge, and, like the scales now popular in retail stores, tells the total price at a given value per gallon at the same time. This saves effort for both dealer and customer.



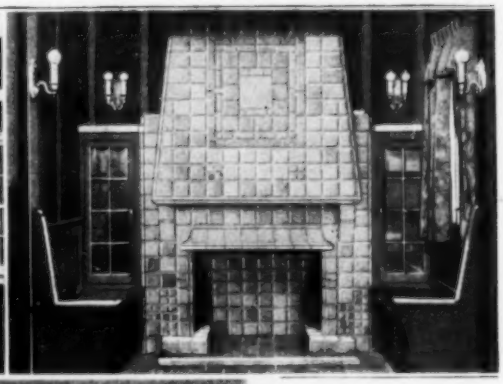
¶ The city of St. Louis, Mo., in 1919 produced more chemicals than New York, New Jersey, Pennsylvania, Michigan, and Ohio combined. This fact is surprising when it is remembered that in 1916 these states produced 77.3 per cent of the total American output.



Complete Miniature Model of a Shipbuilding Yard with Reproductions of All Buildings and Other Features in Detail: When the Basin in the Foreground is Filled with Water, a Tiny Vessel may be Launched

COTTAGE IN BUILDING FOR BUILDERS' SHOW

From the Porch of the Building-within-a-Building the Visitor Steps into the Living Room



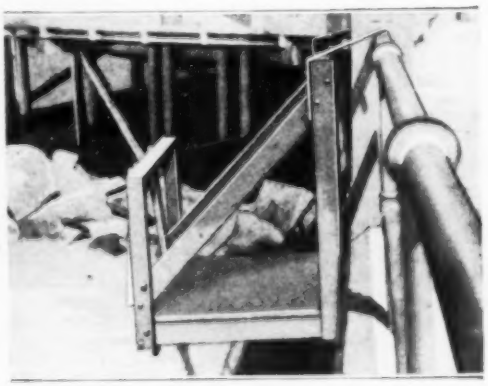
The Inglenook in the Living Room can be Used for Luncheons by Setting in Place a Small Dining Table

Above: The Exterior of the "Sample" Cottage Which Features the Permanent Building-Material Exhibit on the Third Floor of an Office Building in Minneapolis

On the third floor of the Builders' Exchange in Minneapolis, Minn., is a permanent building-material exposition that contains the exhibits of 65 local firms. With this array of samples to choose from, the out-of-town builder can transact in a forenoon the business that formerly required a week or more. The outstanding feature of the exposition is a complete bungalow, which, though it is built between two floors of an office building, contains 400 sq. ft. of floor space. The exterior is made of seven different types of brick, crowned by a roof of asphalt shingles. The interior is handsomely equipped with every kind of space-saving apparatus. Thus the inglenook in the living room can be used for luncheon by setting in place a convertible library and dining table. From the living room one steps into a dressing closet which a few manipulations transform into a bedchamber. Similar compactness and convenience characterize the bathroom and kitchen.

DIVING PLATFORM HUNG WHERE DESIRED ALONG PIER

Small diving platforms that can be hung from the rail, at any point desired by the bathers, have been contrived by the proprietors of one ocean amusement pier. Each platform is about three feet square. Braced uprights, bearing the forged-iron suspension hooks, rise from two corners. On the bottom are four castors on which the platform may be rolled along the pier at the bather's direction. A low rail on the outer edge guards the bather, and is removed when he is about to dive.

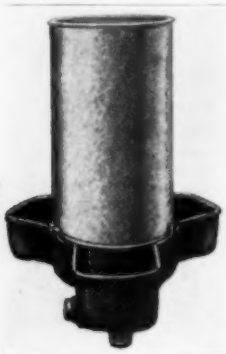


A Number of Diving Platforms like the One Illustrated Are Now in Use at an Ocean Amusement Pier. They are Hung from the Guard Rail Where Desired. Each Platform Is About Three Feet Square

¶Nearly 70,000 acres in western Canada, acquired by the Soldier Settlement Board, have been sold to ex-soldiers.

WATER TROUGH OF NEW DESIGN MADE FOR STOCK FARMS

A drinking trough of new design is now being produced for the farmer and stockman. The trough proper is an iron casting with three compartments for the accommodation of as many animals, and with three lugs projecting from the bottom so that it can be screwed to the floor or platform. Held upon this casting by three bolts, is a large tank of galvanized iron, from the bottom of which the water drops into the trough. The flow is regulated by a float valve of ordinary type. It is obvious that the peculiar shape of the trough makes impossible the intrusion of feet and bodies, and so prevents contamination of the water.

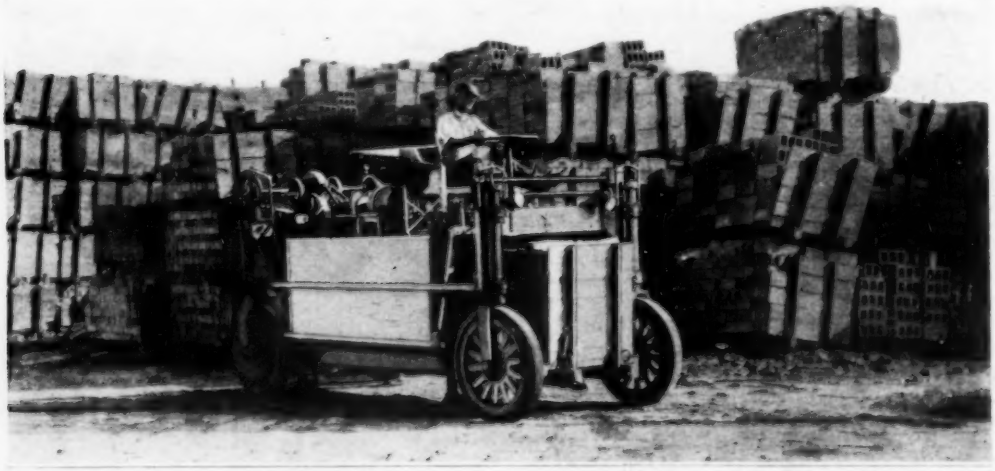


TRUCK THAT STRADDLES LOAD USED FOR HANDLING BRICK

Any method of reducing building costs is interesting nowadays, and saving labor in handling material is an important item. An electric lumber-carrying truck that straddles its load, automatically picking it up and depositing it, as described in this magazine in June, 1917, now has been adapted to the handling of brick and tile. The brickyard product is packed in crates of 1,000 as it comes from the kiln, and the queer truck picks up two crates, or almost 5½ tons, at a time. At the building, the crates are set down in the same manner, by a lever at the driver's hand, either loading or unloading being possible in 11 seconds. Not only is labor saved, but breakage of the bricks in unloading is eliminated.

GRAPHITE FED INTO ENGINE BY NEW AUTO ATTACHMENT

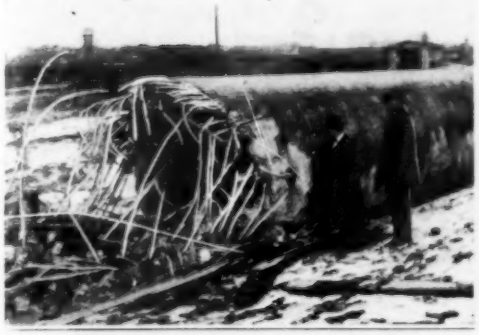
As a lubricant for auto-engine cylinders, it is asserted that graphite is superior to oil, sealing the piston against leakage of gasoline or oil, preventing carbon formation, and permitting higher operating temperature. An attachment now on the market holds a charge of pulverized graphite in an aluminum-trimmed glass cup, and feeds it automatically into the cylinders through the manifold, with the gasoline. An ounce of graphite is sufficient for 1,000 miles in a four-cylinder engine, as very little is required after the first charge. The appliance is readily attached and does its work without attention.



Brick and Tile, in Crates of 1,000, Automatically Picked Up, Two Crates at a Time, and Carried to Their Destination by a Peculiar Electric Truck That Straddles Its Load: Not Only is Labor Saved, but Breakage of the Bricks in Unloading is Eliminated

CONCRETE STACK DIFFICULT TO DEMOLISH

BY GEORGE F. PAUL



The Huge Tube of Concrete, When It Finally Fell, Revealed a Tangle of Reinforcing That Easily Explained the Difficulty of Wrecking It

THE city of Spokane, Wash., had a white elephant on its hands in the form of a giant stack, solidly built of reinforced concrete and rising to a height of 210 ft. This stack was the remains of an old crematory building which had been demolished when a new crematory was built a short distance to the north. The change was brought about through the desire of the Spokane and Inland Empire Railway to widen its yards, and ground was accordingly traded. As a result the white elephant was left standing in solitary and threatening grandeur. The city wanted to wash its hands entirely of the overgrown creature, and the railroad company was perfectly willing to hand the towering stack over to anybody wanting a symmetrical toy of goodly proportions. As the days passed by, both the railroad company and the city officials became more and more afraid of the threatening structure. If it fell to the south it would undoubtedly destroy considerable railroad property; if to the north, it might almost ruin the new crematory, to say nothing of possible loss of life. Some contracting firms inspected the stack and figured on the work, but not one of them would assume any liability for damage. After much heated discussion, extending over a period of two years, the courts finally decided that it was the duty of the city to remove the stack.

When the city engineering department took up the work, it was found that the stack leaned slightly to the south and east. A deadman was anchored north of the direction in which it was hoped to fell the stack. It was believed that in this way the tendency of the stack to go too far south might be counteracted. An attempt to shoot a line over the top of the

The Old Stack, Just Before It was Wrecked, is Seen at the Left, with Guiding Cable Attached. The New Crematory Is at the Right

stack with a gun, used for this purpose by the fire department, proved a failure—the stack was too high. Then a light scaffold was built up on the inside to a height of 100 ft., a hole was made through the shell of the stack, and a ¾-in. cable fastened to another anchor on the inside. The cable was then attached to a rope line, which passed through a double and a triple block fastened to the drum of a windlass. Thus the windlass and blocks could exert a pull of about 20 tons, yet even with this powerful force the top of the stack could be drawn over only about one inch.

The next move was to drill a belt of 65 holes through the stack on the side on which it was desired to have it fall, leaving one-third of the circumference untouched except for several emergency holes to be used if necessary. Drilling these holes was difficult work on account of the many reinforcing rods.

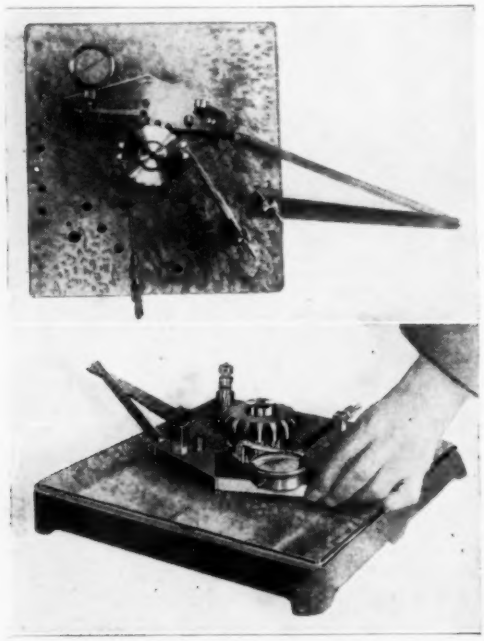
Then began the work of blasting away the concrete. The opening on the north side of the stack for the smoke flues was 4 ft. wide and 7 ft. high. A similar opening was blasted out directly opposite. This left two sections to act as columns

and support the weight. Then these piers were loaded, and shot at the same time. The stack listed about a foot in the direction of the cable, but failed to fall. It was supported only by the reinforcing rods and one-third of the circumference. Then the steel bars were cut with an acetylene torch, yet even then the stack did not topple, though about 30 in. out of line.

Next the emergency holes on the still untouched part of the circumference were shot, and the stack began to fall slowly in the direction of the cable. The cable was rapidly pulled taut and determined the direction of the fall. Finally the portion of concrete left on the back broke, allowing the stack to drop, and this in turn broke the reinforcing, whereupon the stack fell rapidly. The upper portion of the stack collapsed completely, and buried itself deep in the soft ground. To fell this stack took the crew of four men five days, and the total cost for labor, staging, lines and powder amounted to 275 dollars.

TESTING MACHINE DETECTS MISSHAPEN GEAR TEETH

In many automobile factories gears for the transmissions are now tested before assembly by means of what is called an



Above: A Plan View of the Gear-Testing Machine. Below: The Dial Revealing the Presence of Misshapen Teeth

"involute-contour indicator." If the gears pass this inspection, the manufacturer can be assured, the makers assert, that the transmission will be practically noiseless. The machine consists of a base plate on which is mounted a plug of the same diameter as the base circle of the gear to be inspected. Centered upon this plug is another, which holds the gear. A straightedge rests upon the base plate, and is held in contact with the base-circle plug by means of a steel ribbon and coil spring. As the straightedge is rolled around the base-circle plug, the short arm of a five-to-one lever, pivoted on the straightedge, follows the tooth form. Meanwhile the long arm of this lever keeps contact with the plunger of an indicator dial. If the tooth is true, the indicator pointer will not move. If not, the pointer will reveal deviations of .0002 in. or more.

STUDENT ARCHITECTS LEARN BY MAKING PAPER MODELS

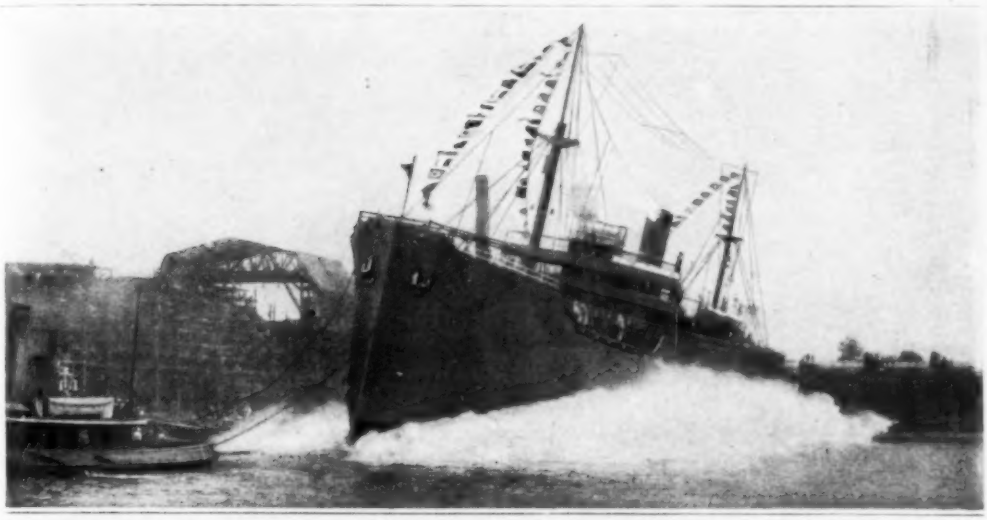
One of the most interesting of the new teaching methods now being practiced in the School of Architecture at Columbia University is that concerned with the construction of cardboard models. Heretofore, it may be explained, the student has done almost all his original work upon the drawing board, and hence has seldom been able to see his design worked out in three dimensions. His first building has, in consequence, sometimes revealed unsuspected misconceptions in the architect's mind. The models are made of heavy illustration board, and are complete in every exterior detail.

STEAMSHIP LAUNCHED READY TO SAIL

To launch a large steamship with steam up, ready to cross the Atlantic, was something new in the history of shipbuilding on the Delaware River, the "Clyde of America," as it has been known since war days.

The ship that in this way set the pace for marine architects and engineers was the "John Jay," a 12,800-ton cargo carrier, launched, last June, at Gloucester City, N. J., in the presence of one of the largest gatherings of representative shipyard officials in years.

Because of the lack of space in the

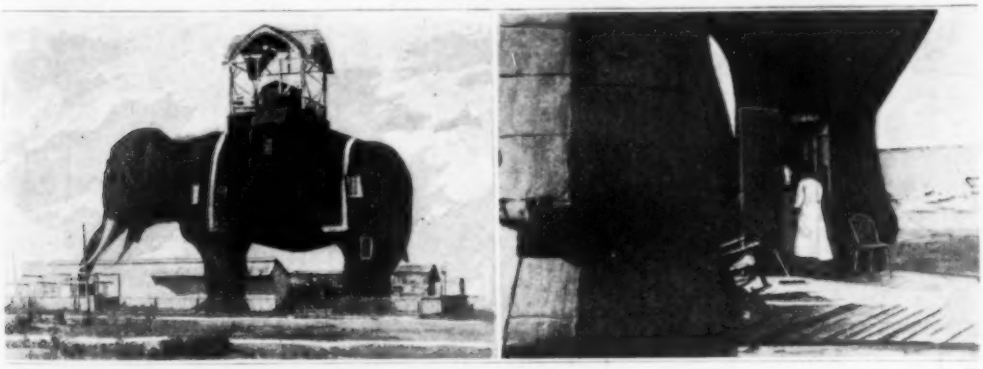


The Unusual Launching of the 12,800-Ton Freight Steamer "John Jay," Which Took to the Water Sideways, with Steam Up and Fully Equipped: It Left the Scene Shortly Afterward on Its Own Power

launching basin the ship was sent into the water sidewise, and as it slid down the ways, smoke was flowing from its smokestack and its own whistle was sounding. Striking the water, it sent up a huge wave and leaned so far to one side as to seem to the uninitiated to be in danger of capsizing. But in less than a minute it had righted itself and soon was steaming, without the assistance of tugboats, to an adjoining shipyard, where, on the day following, it was given a dock trial to make sure that its engines were working properly. Later it was given a trial on the river to test its steering equipment and adjust its compasses, and the third day after the launch it was accepted by the United States Shipping Board and assigned to a steamship company engaged in overseas trade. It is now busy in the service of the company.

BEACH RESORT IN FORM OF MONSTER ELEPHANT

At one end of the famous boardwalk at Atlantic City, N. J., is a resort that for eccentricity is unrivaled. The building takes the form of an elephant, nearly 100 ft. high, and correctly proportioned from tail to proboscis. Entering the hotel through a narrow door in the off hind leg, the visitor finds himself in a strange interior of irregular rooms, and many staircases. Surmounting the last of these, he steps upon a platform, which is nothing less than the howdah. Here he may enjoy a magnificent view, while fortifying himself with the refreshments which the place provides. These are the more appreciated if the visitor has previously inspected the whole of the vast and mazy interior.



PHOTOS BY GILLIAMS SERVICE

The Size of the Strange Building is Revealed by Comparison, at the Left, with the One-Story Structures at Its Feet. Irregular Rooms and Many Staircases Fill the Interior; on the Top, like a Huge "Howdah," Is the Breezy Observatory Platform. The Entrance Door in the Hind Leg is Seen at the Right

HEAVY SIGN FALLS THROUGH TOP OF AUTO

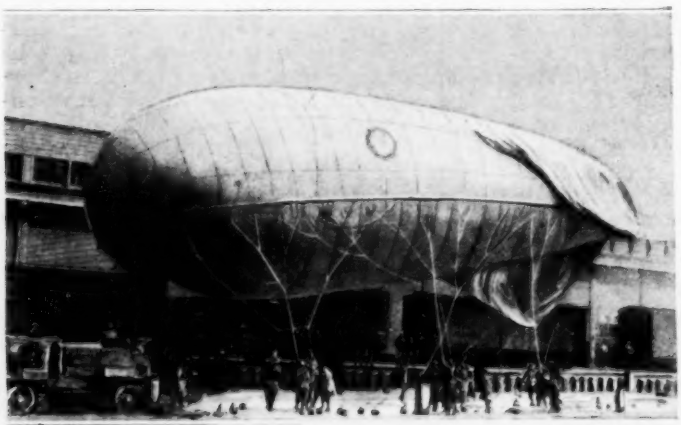
The Big Gasoline Sign Fell Just in Time to Smash into a Car That Paused beneath It, but a Second Too Late to Hurt the Driver

Just as an auto driver in a Texas city paused to let a street car pass, a few days ago, a heavy electric sign which overhung the street, its holdings weakened by storm, let go its post and crashed down through the top of the car. By a curious freak of fate, the sign belonged to an auto-supply station, and advertised gasoline. The noise of the breaking fastening so startled the driver that he instinctively started the car, saving himself by a few inches as the big sign smashed through just behind his seat and wedged itself cornerwise into the frame of the demolished top.

PHOTOGRAPHERS IN BALLOON MAP WATER FRONT

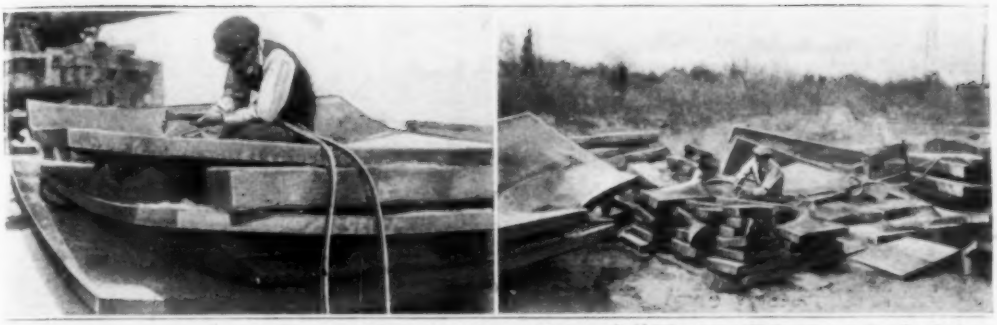
The San Francisco Chamber of Commerce now possesses a complete set of aerial photographs depicting the city's long water front, as a result of a combining, several weeks ago, of the efforts of local military and civil authorities. The military played its part by bringing from the Arcadia Balloon School, near Los Angeles, a kite balloon, motor winch, and operating crew of 65 men. The California State Harbor Commission supplied a tug, and the Chamber of Commerce a barge.

A pier at the southern extremity of the water front was chosen as a starting point. Here the barge was tied up, the



The Winch was Driven upon the Deck of the Barge, and Here the Balloon was Inflated. Preparations are being Made, Above, for the Operations of the First Day

Anchored to a Barge, and with Two Photographers in the Basket, the Balloon was Towed from End to End of San Francisco's Long Water Front. The Work was Completed in Two Days

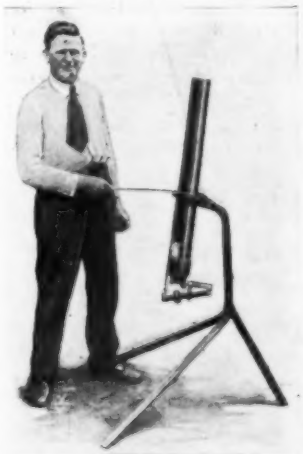


One of the Massive Rectangles of Armor Plate is being Sliced into Sections, at the Left, by One of the Oxyacetylene Cutters Recently Sent to the Government Proving Grounds at Sandy Hook for This Work. A Pile of These Sections is Seen in the Foreground at the Right

winch driven aboard, and the balloon inflated. As the barge was towed into open water, and down the bay, the bag was allowed to rise from the deck, with two photographers in the basket. The making of the overlapping photographs went steadily forward, until a brisk breeze arose in mid-afternoon, necessitating the descent of the balloon and a return to the starting point.

CARNIVAL GUN THROWS CORN AND CONFETTI HIGH IN AIR

For shooting corn, confetti, and similar adjuncts of festivity, high into the air, whence it falls back upon the shoulders of the crowd at carnival or fair, there has recently been introduced a simple gun. It consists of a 3-ft. barrel, made of seamless steel, and mounted on a standard of strap iron. At the breech is a chamber for a blank shotgun cartridge, and a trigger for firing it. Halfway down the bore of the barrel is fixed a steel disk, perforated with many 3/16-in. holes. To operate the gun, a quart of corn and as much confetti are poured down the muzzle, to be stopped before reaching the cartridge, of course, by the disk. The barrel is then pointed skyward, the lanyard is pulled, and the charge rises to the housetops.

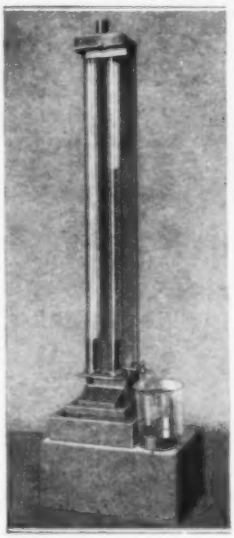


OXYACETYLENE FLAME SLICES 4,000 TONS OF ARMOR PLATE

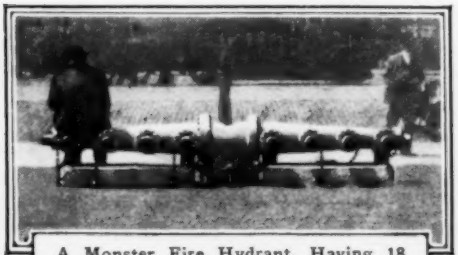
A crew of oxyacetylene cutters was sent to the government proving grounds at Sandy Hook, recently, to cut up for resmelting 4,000 tons of armor plate, used as targets for the big guns during the war. Each plate, weighing between seven and eight tons, and measuring 3 in. thick, 9 ft. wide, and 13 ft. long, was sliced like so much fudge into sections approximately 13 in. wide, 25 in. long, and 300 lb. in weight. The sections varied a good deal in size, however, as each of the plates was punctured at least six times by shell holes.

OPTICAL INSTRUMENT GAUGES COLOR VALUE OF OILS

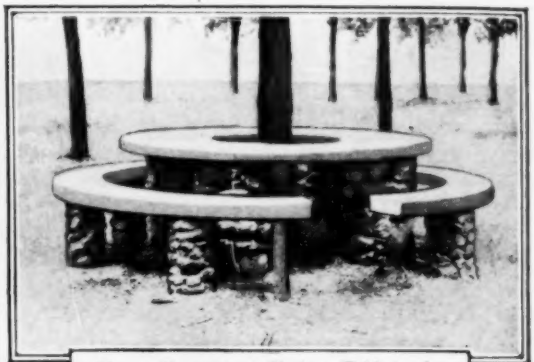
One method used by large buyers for judging the value of oil is to observe its color. To make this a positive process, an instrument has been developed in the Oklahoma fields, consisting of two vertical glass tubes, with an eyepiece at the top, through which both are visible. A glass slide of standard color is placed at the bottom of one tube, and the other filled with oil. The oil is then allowed to drain out slowly, and when the colors match, the height of oil remaining indicates the value.



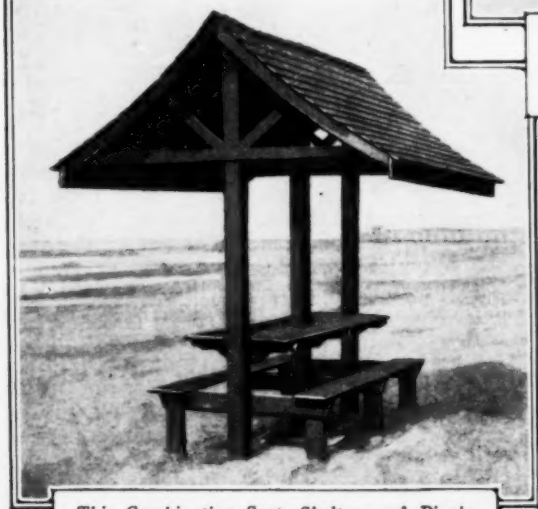
CIVIC FEATURES THAT PROMOTE THE COMFORT



A Monster Fire Hydrant, Having 18 Hose Connections, has been Installed at a Strategic Point on the Waterfront at San Francisco, California



Three Permanent Dining Tables, the Most Curious of Which is Pictured Here, are Provided for the Use of Auto Tourists Who Camp Overnight in the City Park at Wamego, Kansas

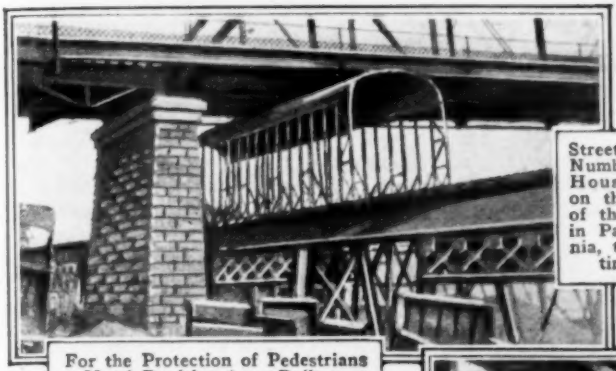


This Combination Seat, Shelter, and Picnic Table Is Popular with the Patrons of a Public Bathing Resort at Hermosa Beach, California. As It is Built as a Unit It can be Moved Easily by Two or Three Men

Keepers of the Wild Animals of the Golden Gate Park in San Francisco Now Enter the Outdoor Pens, Not through Gates Which may Carelessly be Left Open, but by Means of These Stiles

On Three Mornings of Each Week the Truck Farmers from the Vicinity Back Their Loaded Wagons against the Curbing in Two City Parks in Memphis, Tennessee, and Sell Directly to the Housewives. Both Groups are More than Satisfied with the Arrangement

AND ENJOYMENT OF VISITORS AND RESIDENTS



For the Protection of Pedestrians a Metal Roof has been Built over a Footbridge in Cincinnati, Ohio, Where It Passes under One of the Railroad Bridges That Span the River

Street Names and the Numbers of Adjacent Houses are Painted on the Glass Globes of the Street Lamps in Pasadena, California, to Avoid Nighttime Confusion

Heavy Iron Warping Posts, with Bases Attached, are Now Used in San Francisco, California, to Close Streets Temporarily

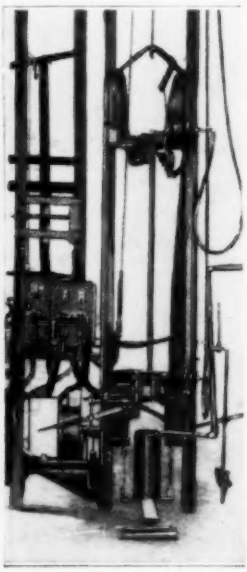
This Bronze Group, One and a Half Times Life Size, and Christened "The Bucking Broncho," is to be Installed in the Civic Center of Denver, Colorado

Over the Mouth of the Chief Ute Mineral Spring in Manitou, Colorado, has been Built a Fountain in the Form of a Huge Bottle

A Tumbling Mountain Stream Flows through Reno, Nevada, Making It Possible for Local Sportsmen to Hook Trout Sometimes within a Block or Two of the Center of the Town

STEEL TUBING HEAT-TREATED BY ELECTRIC CURRENT

Heat-treating steel tubing by its own electrical resistance, a current of high amperage at low voltage being passed directly through it, is a recently patented process of great value and interest. The apparatus used is practically automatic. The length of tubing to be treated is held vertically between pneumatically operated copper-faced chucks, which act as terminals for a step-down transformer. The current used is about 8,000 amperes per square inch of cross section, at three volts per foot of length. No pyrometer is needed, and no special attention is paid to temperature, the expansion of the tubing cutting off the current at the critical point, which is usually reached in less than one minute. At the same instant, the chucks are released, and the tube drops into a cylinder of oil and is quenched.



The stock is not warped or distorted, no matter how thin, and any defects are readily observable while the tube is hot. It is found that expansion stops at the critical temperature, followed by a slight contraction, giving its own indication of complete treatment. Though its most useful application is to materials used in automobile, airplane, and similar constructions, it is interesting to note that the first experiments were made with steel lance shafts for Russian Cossacks during the war. It is asserted that solid stock may be heat-treated the same way, using .06 kw-hr. of current to the pound of material.

PANAMA CANAL ZONE SHAKEN YEARLY BY MANY QUAKES

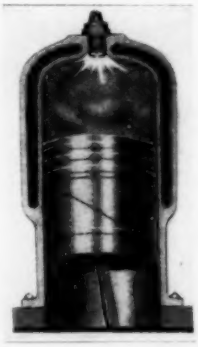
The traffic-blocking slides at Culebra Cut seem to be explained when it is learned from a recent report of the Panama Canal Commission that the zone was shaken in the period from 1906 to 1920 by no fewer than 457 earthquakes. As a matter of fact, however, numerous as they were, these disturbances were always harmless, and were usually perceptible only to the four sensitive seismographs in the Administration Building at Balboa Heights. Their frequency is attributed to the presence of an abrupt break, or fault, which is thought to extend all along the Pacific Coast at no great distance from the shore line.

INDICATOR IN WHEELHOUSE SHOWS ANGLE OF RUDDER

An electrical apparatus now being added to the equipment of British steamships indictates on the navigating bridge, or in the wheelhouse, the exact angle the rudder makes at every moment with the ship's center line. The indicator consists of a graduated scale across which a pointer moves in response to electrical impulses from a small mechanism beside the rudderpost. This mechanism consists of many contact points over which moves a switch bar linked to the post. The indicating pointer drops from view, finally, when the electric current fails or the apparatus becomes otherwise disarranged, in order that no false indication may be given.

GROOVED ALUMINUM PISTONS FIT CYLINDERS CLOSELY

To overcome the relatively large expansion of aluminum-alloy pistons in auto engines, an eastern accessory manufacturer employs diagonal grooves running up from the edge of the skirt and joining horizontal grooves just below the piston rings. This enables a clearance as small as .0005 in. to be used, aluminum pistons ordinarily needing from .0045 to .01-in. clearance. Gas and oil leakage past the piston, with its attendant troubles, is prevented, and all the advantages of lightness retained by this simple and inexpensive expedient.



¶On receipt of a promised gift of $5,000,000 a building will be erected in Washington, D. C., for the National Research Council and the Academy of Sciences.

The Newly Discovered Paint-Pigment Beds of the Salton Sea: The Lines Are the Walls of Adobe Reservoirs on the Mudflat Where the Pigment-Bearing Waters are Impounded for Cooling, to Precipitate the Mineral Held in Them

VAST STORES OF MINERAL PAINT PIGMENTS IN SALTON SEA

By JOHN EDWIN HOGG

SEVERAL years ago a number of men took up profitless mineral claims on Mullet Island, a tiny volcanic formation protruding above the saline waters of the Salton Sea of southern California. Gold and pumice were the minerals they were seeking, and little did they think that the waters which lapped against their rocky shores hid from their view a mineral deposit of another variety and practically incalculable value.

During the several years that the mineral prospectors have delved with their picks and shovels into the rocky island, quantities of a highly colored, dustlike substance have been washed up onto the shore by the sea. Chemists pronounced it mineral paint pigment, but where it came from, no one could say. The deposit on the rocks at the water's edge was not sufficient for commercial exploitation.

Last year the Salton Sea developed another of its characteristic temperamental streaks. Its surface level dropped 4½ ft., leaving Mullet Island surrounded by hundreds of acres of soft slimy mud. Presently the attention of the prospectors was attracted to the mudflats by a strong odor of sulphurous gas and noises which sounded like the fierce boiling of thou-

These Beds Produce a Vivid Green Pigment Which Only Requires Mixing with Oil and Turpentine to Produce a Durable Green Paint. The Raised Portions Are Solid Banks of Pigment

sands of teakettles of colossal proportions.

They investigated by providing themselves with long wooden shoes resembling a hybrid ski and snowshoe, and with which they were able to walk about over the slimy mud without becoming bogged. At no great distance from the shore, they found, uncovered by receding waters of the sea, numberless boiling hot springs, tiny geysers, and mud volcanoes. From these flowed various-colored saline waters, some bright red, others green, blue, and yellow, with all the intermediate shades of the rainbow. Great accumulations of the material were soon built up around each of the springs, and samples were soon in the hands of a chemist. Analysis disclosed it to be mineral paint pigments: ocher, carmine, ultramarine, and all the other colors essential in the manufacturing of paints.

Miniature Volcanoes of Boiling Mineral Pigment: Those Appearing Light Are Yellow, While the Others Are a Vivid Green and Several Shades of Blue

The prospectors immediately began the construction of impounding reservoirs to segregate the waters from springs of individual colors. These reservoirs were made by spading up the mud to form a wall, that is soon transformed into hard adobe mud under the baking effect of the desert sun. The boiling water is drained very slowly through these impounding beds, and the cooling causes the paint pigment to be precipitated to the bottom of the pools.

After several days of aeration, the water from each spring is diverted into another pool. Then, after drying in the sun for a few hours, hundreds of pounds of pigment are spaded out of each pool. The pigment is first dug out into boxes, trundled onto the island in wheelbarrows, and later sacked for shipment to the paint factories. It comes from the pools practically pure, and requires little or no refining.

A crop of low-grade salt is a profitable by-product of the newly developed pigment industry. All the pigment springs are highly saline, and the water, after being purged of its pigments, is drained into an evaporation reservoir, where the sun quickly takes possession of the moisture, leaving a heavy deposit of clear, white

The Pigment Pool Which the Men are Examining Produces a Brilliant Carmine Pigment, While the One Surrounding It Flows Yellow Ocher. Note the Spout Holes from Which the Boiling Substance is Exuded. The Surrounding Deposits Are Pure Ocher

After the Boiling Pigment Springs have been Purged of Their Mineral Harvest, the Water is Evaporated in Large Aeration Reservoirs, Yielding a Valuable Crop of Low-Grade Salt

salt. This salt is periodically plowed up, and stored on the island in gunny sacks for later sale as ice-cream salt. It is also used for the manufacture of ice. It could, of course, be refined to give the higher grades of pickling and table salt, but for the present, the industry being yet in its infancy, the owners of the deposit are content to sell it as crude salt, for which they receive two cents per pound. The paint pigments bring $40 a ton delivered in carload lots to the railroad station at Niland, five miles away.

Up to the present only small shipments of pigments and salt have been made from the newly developed industry. This is for the reason that the water has not yet been off the source of supply long enough to permit the building of roads or the installation of machinery. Just as soon as the mud slime has hardened to the point of being able to support heavy weights, a truck road will be built to the pigment beds. Trenching machines will then be used for digging the pigments out of the beds. It is expected by the end of this summer production will be in full swing, and that thenceforth this new-found natural resource will be more fully exploited.

A Tiny Geyser of Boiling Water and Steam Which Spouts Yellow Ocher

KELP BY-PRODUCTS USED AS CATTLE FOOD

Preparations are being made at kelp factories on the coast of Washington State to utilize, as fodder for cattle, by-products which are declared to be as nutritious for this purpose as alfalfa. Heretofore the kelp pulp has been thrown away after the potash, iodine, and other valuable chemicals have been extracted. At Puget Sound, and along the coast of Washington, the kelp harvest begins in June. The season of operations extends over a period of about seven months.

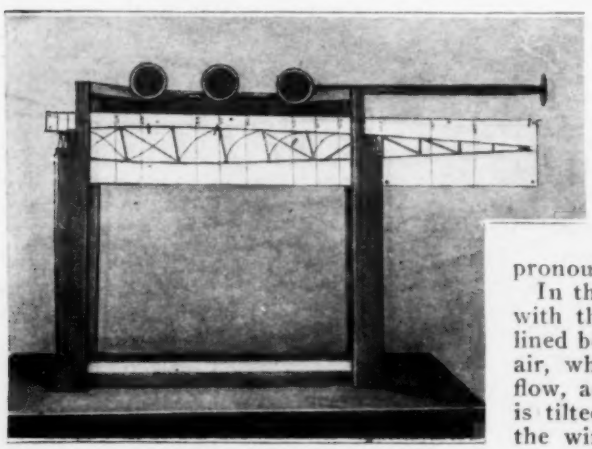
¶The growing importance of motor-truck transportation, and the awkward cumbersomeness of that term in describing it, has led a large tire manufacturer to suggest the general adoption of the coined word "truckportation."

ROCHESTER'S BARGE-CANAL HARBOR RECEIVES ITS FIRST SHIPMENT

PREPARATIONS recently completed by the city of Rochester for the full utilization of the New York State Barge Canal, embracing the construction of a modern harbor and dock equipped for handling all canal shipments, brought their first fruition the other day. Three heavily loaded barges, drawn by a small but powerful towboat, swept up to the concrete dock, the lines were made fast, and the ceremony of unloading 1,250,000 lb. of sugar began. The sweet cargo filled two of the barges, the third carrying a load of ivory nuts for the city's button factories. The trip from New York to Rochester took 10 days, including stops, while other barges were dropped at points along the canal. The picture shows the three barges moored at the harbor dock, with the new Clarissa Street bridge in the distance.

VARIABLE-CAMBER WING ACTS AUTOMATICALLY

Of all the inventions conceived during the last decade in the hope of decreasing the landing speed of airplanes, none has promised more in preliminary tests than a device recently evolved by the U. S. Bureau of Standards. It is nothing more than a simple, variable-camber rib which is used, instead of the ordinary rib, in the construction of one plane of a biplane, or of the top and bottom planes of a triplane. One peculiarity of construction is that the nose of this flexible rib is fixed to the front spar, while the tailpiece is rigid and slides on the rear spar. Another peculiarity is that the rib structure between the spars is normally symmetrical, or uncambered, but is deformed by nonsymmetrical air pressure until it becomes a rib of most pronounced camber.



The New Steel Variable-Camber Airplane Wing is Seen Here under Test in the Laboratories of the Bureau of Standards. This Rib Weighs Less than the Ordinary Wooden Rib

In theory, then, the airplane wing built with these ribs will be a simple, streamlined body, offering little resistance to the air, when traveling parallel with the air flow, as at high speeds. As the fuselage is tilted upward for a landing, however, the wing will be deformed until it possesses a decided camber, which will act to bring the airplane to a stop after a short run. The new rib is made of metal.

EROSION, PUT TO WORK, IS FOUND INTRACTABLE

Clear across the extreme southern point of Illinois, the Cache River flows parallel with the Ohio, and only about 10 miles away, until it turns and joins the larger stream just below Mound City. Along its course are some 81,000 acres of fertile swamp soil and overflow land, only awaiting drainage to become highly valuable. Some time ago the engineers decided to cut a channel between the rivers by way of Post Creek, where the fall is small and the canal would grade only a foot to the mile. A channel was planned with a 30-ft. base, a maximum depth of 41 ft., and a top width of 115 ft., and erosion, when the way was opened, was counted on to do most of the work.

The Rock Ledge Uncovered by Erosion in the Cache River Drainage Project, on Which Blasting Operations have Already Started: This Barrier Was Largely Responsible for the Damming Back of the Drainage Water and the Diversion of the Erosive Action

Once unleashed, however, the natural force failed to recognize the boundaries set for it. The 41-ft. depth became 56 ft., and the 115-ft. width spread out to 300 ft., like a miniature Culebra Cut. And in the midst of the widening flood appeared a wholly unsuspected ledge of rock, defying and diverting the erosive action. As a result, crops near the head of the cut-off are damaged by inadequate drainage, and those below flooded out by what drainage there is. It is thought now that a judicious use of dynamite will bring the results originally contemplated. The work will cost $100,000 in addition to the $500,000 already spent, but the sum is small in view of the ultimate benefit.

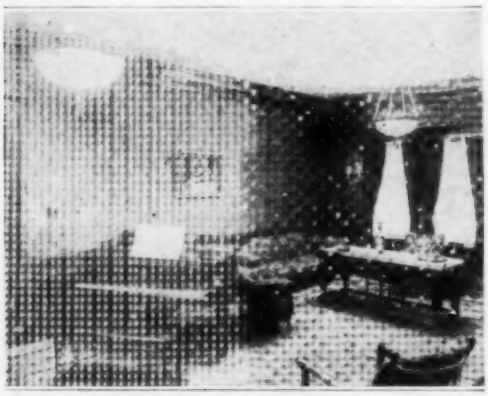
The Post Creek Channel from the Cache River to the Ohio, Greatly Enlarged and Deepened by Unexpected Erosive Action: The Intended Width of 115 Feet Became 300, and the Depth Increased from 41 to 56 Feet

FAMOUS PASSENGER LINER IS NOW LARGEST OIL BURNER

For a number of months a force of 4,000 workmen has been engaged in the task of converting the huge passenger liner "Olympic" to the use of liquid fuel, and the famous ship is now declared to be the largest oil burner in the world. The 29 boilers are heated by a total of 195 furnaces, and each of these had to be fitted with a burner to which the oil is fed in a fine spray. On every trip it makes, the steamer will consume 25,000 bbl. of oil, and the carrying capacity of its fuel tanks is approximately 50,000 bbl. The installation of oil burners is part of a general overhauling that the big boat has been undergoing for almost a year, following its use as a transport during the war, when it carried more than 200,000 troops.

FLY SCREENS PAINTED BLACK AND WHITE TO GIVE PRIVACY

By a trick long known to the interior decorator, but well worth the consideration of every householder, the fly screens



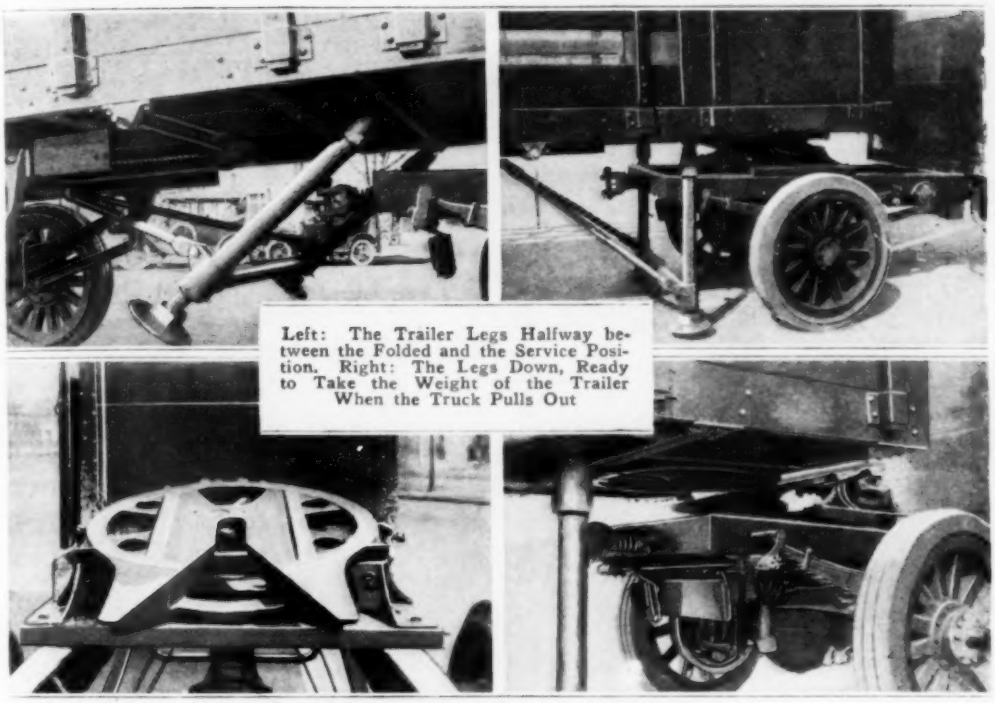
The Left Half of the Fly Screen has been Painted White to Show How, by Careful Use of the Brush, the Screen is Made to Afford Much Daytime Privacy

applied to the windows of a palatial home in New York City have been made practically opaque when seen in the daytime from without, and practically transparent when seen from within. This effect of privacy, so desirable in rooms with windows opening upon a busy street, is achieved in the simplest manner imaginable. The inner surface of each screen is painted dead black, because black absorbs the light. The outer surface is painted white, because white reflects the light, and so serves to dazzle and thwart the eye. Thick paint, applied sparingly and carefully, it may be explained, must be used if the screens are to be painted successfully in this way.

ACOUSTICS OF AMPHITHEATER PUT TO DRAMATIC TEST

The production on so grand a scale of the historical pageant which is to entertain the visitors to Boise, Ida., during fair week this fall is made possible only by the discovery some time ago of a natural, bowllike amphitheater just outside the city. So accurately has nature disposed the hills that scarcely an alteration need be made. But most satisfying is the excellence of the acoustic properties, ascribed to the presence, in rear of the "stage," of a second hillside, which serves as a vast sounding board. That this "sounding board" will function perfectly was proved by a recent test. In the presence of 10,000 citizens of Boise, seated in front of the stage, a man stationed himself at the rear of the stage, 600 ft. away. Here he spoke, in a clear voice, several familiar sentences; then asked "Did you hear that?" This performance he repeated at intervals of 100 ft., until he reached the hilltop, 1,200 ft. distant. Each time an affirmative roar swelled from his audience.

One of the 10,000 Spectators Snapped This Photograph during the Recent Test of the Acoustic Properties of the Natural Amphitheater near Boise, Idaho. A Single Voice was Heard from All Parts of the Hillside in the Background. Halfway up This Slope is Seen a Brass Band Which was, of Course, Even More Easily Heard



Left: The Trailer Legs Halfway between the Folded and the Service Position. Right: The Legs Down, Ready to Take the Weight of the Trailer When the Truck Pulls Out

Left: The Automatically Coupled Fifth Wheel Mounted on the Chassis of the Motor Truck. Right: An Under View of the Trailer, with the Truck Preparing to Back into a Coupling with It

TRAILER SUPPORTED BY LEGS HAS AUTOMATIC COUPLER

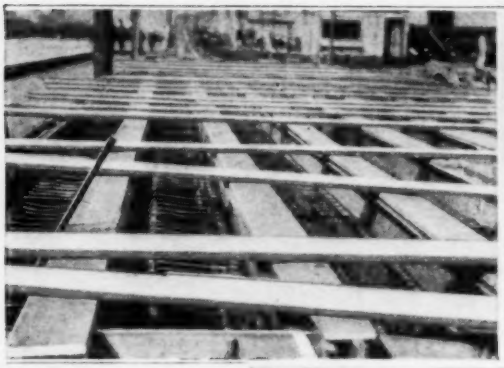
Recognition of the two-wheel trailer's usefulness has set designers at work upon means to save labor and time in connecting it with the truck that hauls it. A vehicle of this type now being produced in Michigan is provided, at the forward end of the body, with a pair of folding legs, adjusted by screws for length, upon which it rests when not attached to the truck. An automatic fifth wheel at the rear of the truck chassis engages and locks with the trailer as soon as the truck backs into place, and the legs are then folded up out of the way by a hand crank geared to a long screw. For disconnection, the legs are lowered again, the fifth wheel released by pulling a lever, and the truck moves away.

AERIAL PHOTOGRAPHER HAS OFFICE IN OIL FIELD

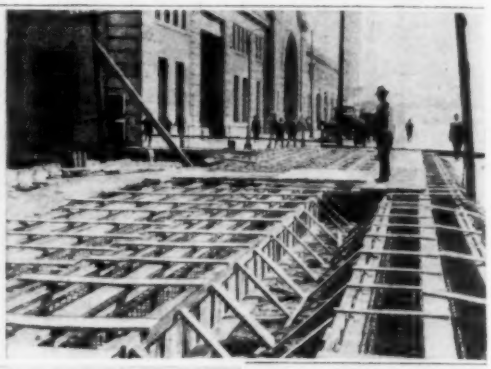
A number of young airmen throughout the country are finding that much money is waiting for the man with an airplane and an aerial camera. Most towns and cities, they learn, are eager to buy pictorial studies of city-planning problems, and progressive photographs of municipal improvements. Industrial and commercial concerns are in the market, likewise, for photographs of their plants and enterprises. It is work of this last sort that is done by the aerial photographer whose office is pictured herewith. Situated in the heart of a western oil field, the little structure is visited daily by oil men desiring bird's-eye views of their property.

This Little Office, Situated in the Heart of a Western Oil Field, is Maintained by an Enterprising Young Aerial Photographer

REINFORCING RODS JOINED TO GAIN STRENGTH



In This Close-Up View are Seen the Crosspieces from Which the "Bundled" Rods are Suspended



In This More General View It is Seen That Each Bundle Has Its Own Mold in Which It Hangs

The Manner of Bundling the Reinforcing Rods to Increase Their Strength is Shown in This Picture. The Resulting Reinforcing Element Is Square in Cross Section

Increased strength is claimed by one building contractor for concrete walls and floors built with his own system of reinforcing. His method involves reinforcement of the reinforcings. If he is building a floor, for example, he first binds the rods together with heavy wire, four at a time, to form structures that are square in section. Each of these reinforcing elements is then suspended in the mold as the concrete is poured in. Local strains imposed on the resulting structure are shared, the contractor maintains, by the four reinforcing rods. "Bundling" increases the strength.

MAIL CARRIER STRIPS AUTO FOR TRAVEL IN BAD LANDS

The driver of the little automobile that regularly carries the mail from White River to Rosebud, S. D., recently decided that the car's top and body were superfluous, if not a nuisance. Appearances count for little in the Rosebud Indian Reservation, anyway. So he removed them, placed a spring seat over the gasoline tank, strapped a spare tire to the rear—and now covers the distance between towns in better time. The trip is no small one, as the towns are separated by 35 miles of bad lands and unbridged streams. An Indian trail is the highway. In wet weather the trail is deep in mud; but since stripping his car the driver cares less, as the mud finds less automobile to stick to, and as, because of the reduced weight, the car does not sink far into the mud.

This Picture of the Stripped Mail Car was Taken in Rosebud, South Dakota, at the End of a 35-Mile Trip across Muddy Bad Lands. Behind the Seat, Which was Taken from a Farm Wagon, are Seen the Mail Sacks Carried as the Regular and Only Load

WHERE EVERYBODY BATHES TWO HOURS A DAY

Probably the widest contrasts in bathing customs in the world are to be found in Colombia, South America. In some sections, especially in the higher interior Andes Mountain regions where it is cold all the time, the natives can never be accused of taking a bath, but in the important city of Cali it is carried almost to the other extreme.

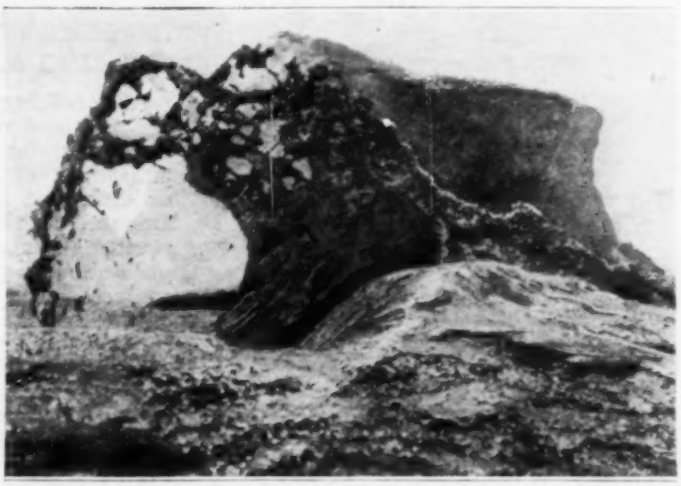
Cali is a city of 40,000 inhabitants, has three railroads, and is the largest Colombian shipping port on the Pacific, yet with all its great volume of business the people set aside a bathing time from 11 to 1 o'clock, and everybody goes down to the river to bathe before eating lunch. The doors of every business house and home are locked at some time during these two hours, usually promptly at 11 o'clock, and no business is allowed to be transacted until the town clock strikes one. During this period the banks of the river

Everybody in the City of Cali, Colombia, Seeks the River between the Hours of Eleven and One Midday, to Gain Relief from the Sweltering Heat of Noonday. Above, the Camera has Caught the First Arrival

are dotted with the clothing of the bathers, put upon any rock that happens to be convenient. The reason for such frequent bathing is apparent when it is known that the climate is exceedingly hot all the year around.

CAMERAMAN SNAPS VOLCANIC ERUPTION TEN YARDS AWAY

An unnerving, but fruitful incident occurred recently as the volcano of Kilauea, H. I., described as the most continuously active in the world, was being examined by scientists of the Hawaiian Volcano Research Association. As the climax of this expedition they had determined to photograph a towering crag of solidified lava that rises, Gibraltar-like, from the surface of a swelling, overcrusted lava lake. For this purpose the camera was set up on the bordering rampart, itself hot enough to fry an egg. But at the instant the cameraman was squeezing the bulb, an explosion within the uneasy mass threw into the air, not 10 yd. from the party, and directly before the lens of the camera, a tumbling mass of white-hot lava. Crashing back, and so breaking the surface crust, these erupted fragments roused the entire lake into a "seething, bellowing mass of fountains." The camera caught the erupted mass in mid-air.



The subject of This Photograph, Snapped on the Edge of the Crater of Kilauea, Hawaii, was to have Been the Crag in the Background, but as the Bulb was Pressed, the Surface of the Lake Erupted with a Roar

---

¶Small naval dirigibles are soon to be used for the charting of the Pacific coast line from Mexico to Canada.

CHILD RIDES ODD VELOCIPEDE LIKE TROTTING HORSE

A velocipede propelled without movement of the hands or feet is a recent invention that should fascinate the active

In This Cutaway View of the Odd Velocipede is Seen the Rack, Ratchet, and Other Propelling Mechanism

boy or girl. Propulsion is effected simply by the weight of the rider, who rises and sinks in the saddle as a horseman does in "posting" at the trot. Every time the saddle descends, it depresses a vertical rack. This rack turns a ratchet wheel which, in turn, is geared to the rear wheels. A coil spring keeps the saddle in contact with the rider as he rises for each power stroke.

HIGHWAY SIGNS GIVE ACTUAL MAPS OF DANGER POINTS

Each danger point on the Columbia River Highway has been marked with a sign of new and interesting form. In all cases the sign is 300 ft. from the condition it marks, and so states, while the word "danger" appears in red letters. Besides descriptive wording, each point is illustrated. A crossroads is indicated by a heavy cross; a sharp curve is shown by a broad curved line with a directional arrowhead, and a steep grade is designated by a profile line on the signboard.

IMPLEMENT DROPS FERTILIZER IN RING AROUND PLANT BASE

A fertilizing implement now gaining the approval of farmers, gardeners, and florists in the eastern states applies the phosphate, or other material, in a ring or disk, and in an accurately measured amount, to the soil around a growing plant. The nourishment can thus be supplied during growth, it will be noticed, rather than at planting time. One form of the implement is provided with a slit for accommodation of the taller plants; another is without this opening, and is used for the smaller plants. Both function in the same way. As the implement is picked up by means of the handle, a

The Manner of Using the Slotted Form of the New Fertilizing Implement is Explained at the Left. The Lower Cone has been Separated into Its Two Parts, at the Right

valve in the bottom of the hopper fills with fertilizer; as the implement is set down upon the next plant, the valve

Three Typical Danger Signs on the Columbia River Highway: That at the Left Signifies a Sharp Curve, That in the Center a Crossing, and the One at the Right a Grade. All Signs Are 300 Feet from the Danger Point

During the Summer the Angara River is Crossed at Irkutsk, Siberia, by Means of a Pontoon Bridge. At the Approach of Winter the Bridge is Towed in Sections to the River Bank, Where It Freezes In. Vehicles and Pedestrians Then Use the Ice as They Would a Street. The Winter Views, Above, Show One of the Sidewalks, and Sections of the Stranded Bridge

opens, and the fertilizer falls through the distributing cones to the ground. Using the machine in this way, and with hills about 9 ft. 6 in. by 18 in. apart, a man can cover about three acres a day.

PARKING LIGHT HAS MIRROR AND SAVES AUTO BATTERY

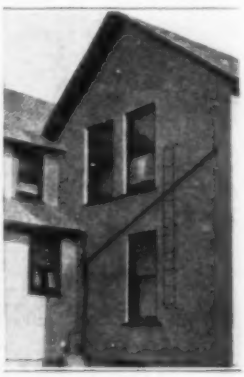
To save the large amount of battery current wasted when an auto is parked at night, with head and tail lights burning, a new form of parking lamp carries only one small bulb, and is mounted on the left front fender. The front lens of the lamp is white and the rear one red, but the latter, in daytime, is covered by a rear-vision mirror. Dropping the mirror to the horizontal position, out of the way, automatically switches on the current and lights the lamp.

BRIDGE AT IRKUTSK STRANDED ON RIVER BANK IN WINTER

The city of Irkutsk, in many ways one of the most important in Siberia, lies on the right bank of the river Angara, which is here about 1,900 ft. from shore to shore. The city is remarkably well planned, having broad, well-paved, and adequately lighted streets, lined with imposing buildings. As yet, however, no permanent bridge spans the Angara. Lacking one, the people of Irkutsk cross the river in three ways. During the summer they use the floating bridge, an old structure of many sections, each supported by wooden pontoons and anchored with large chains. At the close of the warm weather the anchors are weighed, and the sections are towed to the river bank. In a few weeks they are frozen in place, and in a few more there is no need of a bridge anyway. The ice is so thick that vehicular and pedestrian traffic use it as they would a street. As a matter of fact the surface takes on every appearance of permanence when wooden sidewalks are laid and electric-light poles are set in place. Then, during the short springtime, the ice goes out with a rush, and the third means must be used, for the river can now be crossed only by ferry.

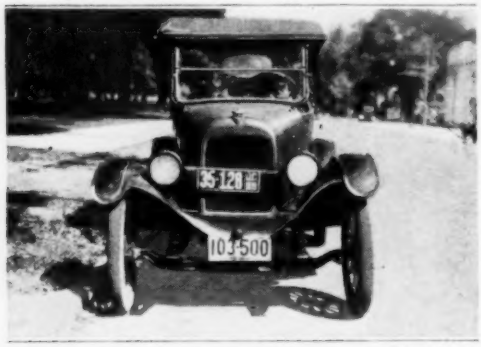
FIRE ESCAPE INSTALLED ON FARM RESIDENCE

To the surprise of his neighbors,, who declare that never before have they heard of a fire escape on a farmhouse, an Iowa agriculturist has recently added such a convenience to his home. He decided to take the step, whether customary or not, after a fire had half destroyed the structure, and had showed him thereby the danger of being trapped in his second-story bedroom. The escape is a simple steel ladder, bolted to the side of the building.



MANY AUTOS AT WASHINGTON HAVE TWO NUMBER PLATES

The District of Columbia issues automobile number plates like any state, but as the whole domain is only 10½ miles

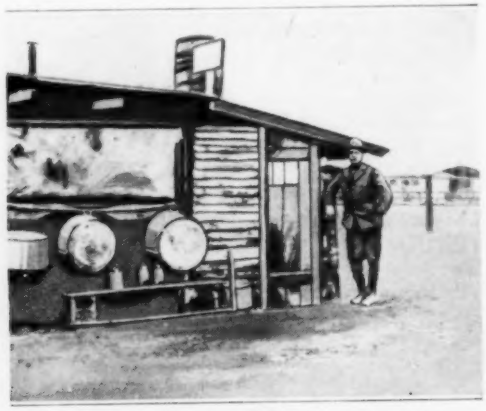


An Auto Carrying Both District of Columbia and Maryland License Plates, Required by Law in Some Cases

long and 5½ to 8½ wide, few cars remain long within its boundaries. Those which cross the line frequently are required to take out a license in the state of Maryland, and to carry two number plates. The same is true of Maryland cars which often cross into the District of Columbia. These two-number cars are common sights in the national capital.

DESERT BATHROOM PATRONIZED BY TRAVELERS TO SALTON SEA

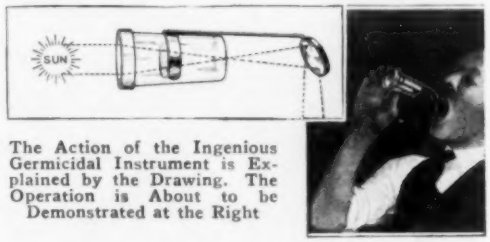
Everyone who travels by automobile from Yuma, Ariz., across the desert to the mysterious Salton Sea, seat of the mullet-fishing industry described last month in this magazine, knows one group of shanties encountered en route as "the place where you can get a bath." One dollar is the price; but lured by the prospect of parting with a prickly coating of alkali dust, few hesitate to part with this amount. The desert bathroom is inclosed by walls of rough boards, and measures five feet square. Upon the roof is a wooden barrel. Having paid the price, the motorist is permitted to clamber to the roof, bucket in hand, until he has filled the barrel. Then he steps into the room, disrobes, and pulls the valve string. His dollar's worth of water runs out quickly; so quickly that most conceive the need of a tub to catch and retain the last 50 cents' worth. This tub the proprietor furnishes—for an additional 10 cents.



At This Desert Shack the Motorist Usually Interrupts His Journey from Yuma to the Salton Sea in Order to Enjoy a Refreshing Bath

LENS AND MIRROR SEND SUN'S RAYS DOWN DISEASED THROAT

In several tuberculosis sanatoriums of the United States there is now being used a little instrument of glass and steel that reflects the sun's rays down the patient's throat and larynx, and so hastens the destruction of the bacilli. The instrument consists of a glass tube, 3½ in. long, to

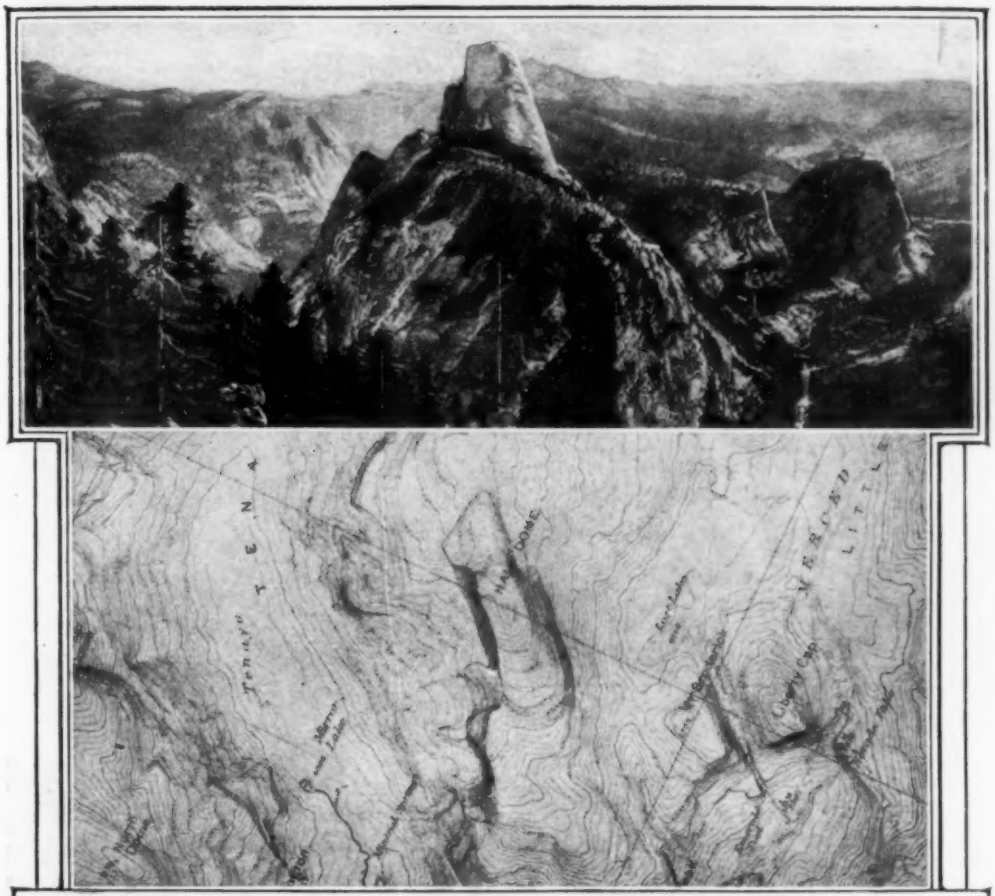


The Action of the Ingenious Germicidal Instrument is Explained by the Drawing. The Operation is About to be Demonstrated at the Right

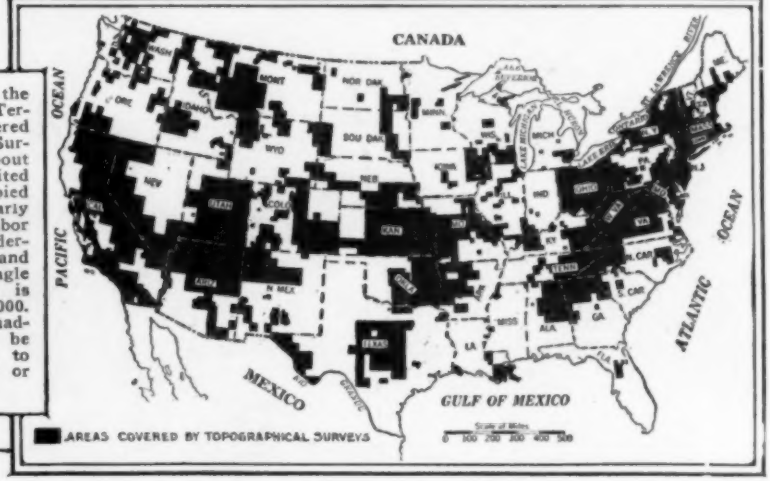
one end of which is fixed a double-convex lens. Projecting from the other is a 4-in. rod carrying, at an angle, a small circular mirror. To use the instrument, the patient faces the sun, and places the tube between his lips, lens outward. The mirror is now located just in rear of the epiglottis. Concentrated by the lens, the sunlight strikes the mirror, and is reflected downward into the throat. The rays do not burn the mouth, as the focus of the lens is within the tube.

¶A labor-saving method for waterproofing sea walls and relining tunnels, lately tried in the East, involves the use of "atomized" concrete. From the drum of an ordinary mixer the concrete is poured into a steam blast. Borne along by its now atomized plastic ingredients, the concrete is discharged as a creamlike spray.

GEOLOGICAL SURVEY MAKES MAPS IN MOUNTAINS

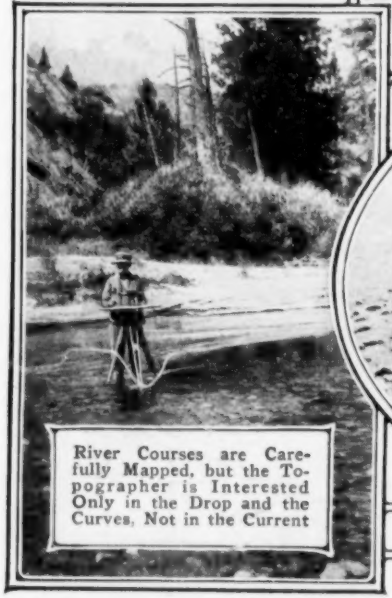


A Photograph and a Contour Map of the Same Region, a Wild and Rugged Portion of Yosemite Valley, California, in Which State the United States Geological Survey's Work, Carried On for 13 Years, is Now Nearing Completion. In This Kind of Country the Contour Lines on the Map Represent 50-Foot Elevations, and Even with This Allowance, the Rises Often Are So Precipitous That the Lines Run Together. Every Fifth Line is Marked with the Height in Feet Above Sea Level. In This Case the Photograph Gives an Interesting Interpretation of the Map



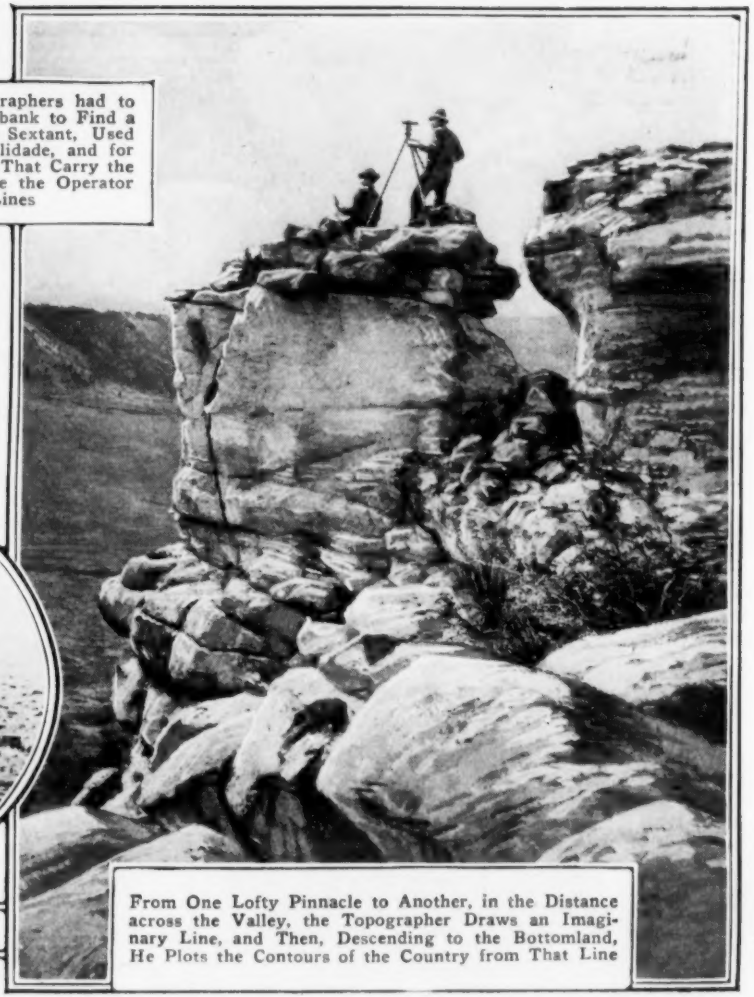
The Black Patches on the Map Represent the Territory Already Covered by the Geological Survey. It Embraces about 40 per Cent of the United States, and has Occupied the Surveyors for Nearly 40 Years. The Labor Involved in the Undertaking Is Enormous, and the Cost for the Single State of California is Estimated at $1,000,000. Each Map Is a "Quadrangle" Which may be Joined with Others to Form a Huge State or District Map

Here the Topographers had to Cut into a Snowbank to Find a Footing for the Sextant, Used Instead of an Alidade, and for the Stadia Rods That Carry the Targets and Give the Operator His Lines



River Courses are Carefully Mapped, but the Topographer is Interested Only in the Drop and the Curves, Not in the Current

In Desert Surveying, the Changes in Altitude Are So Gradual That the Contour Lines on the Map may Represent Only 10 or 15 Feet of Rise



From One Lofty Pinnacle to Another, in the Distance across the Valley, the Topographer Draws an Imaginary Line, and Then, Descending to the Bottomland, He Plots the Contours of the Country from That Line

TOPOGRAPHERS FIND ADVENTURE IN THEIR WORK

A Surveyor Using His Plane Table and Alidade in the Dense Swamps and Brakes, Where Wide Pathways have to be Cut for a Clear View of the Distant Scale

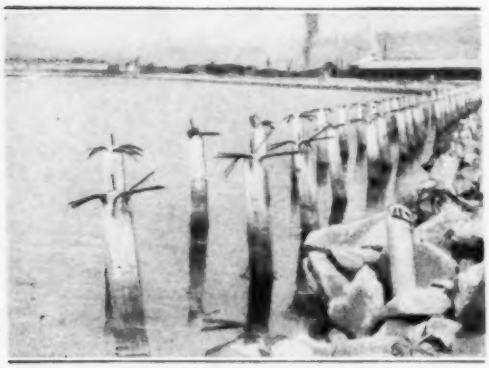
On the Snow-Covered Brink of a Rocky Ledge High in the Mountains, the Topographer's Plane Table with Its Alidade is Anchored with Ropes While He Plies His Pencil in Less Security

One of the Adventurous Features of the Work: The Topographer and His Instrument Are Out on a Tree Limb Overhanging a Precipice of Hundreds of Feet

Here, on the Other Hand, the Position Is So Low That the Plane Table has to be Raised on Stilts, While the Umbrella Keeps the Sun Out of the Alidade

STORM REMOVES LUMBER FLOOR FROM CONCRETE PIER PILES

Concrete's superiority over wood as a building material is clearly illustrated by the remains of a storm-wrecked pier on

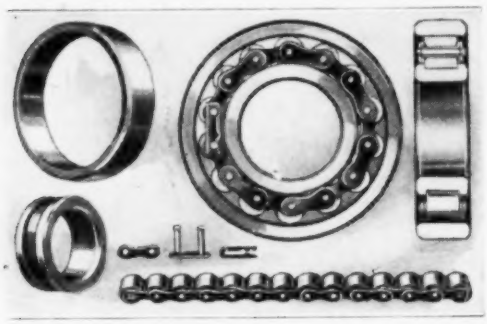


A Storm Tore the Plank Floor from This Pier, but Did Practically No Damage to the Concrete Piles of the Structure

the western coast. The waves completely removed the lumber floor of the structure, but did not disturb or damage the concrete piles underneath. When the boards were torn loose, the protruding iron rods, used to fasten the planks to the stakes, were bent and twisted to some extent, but were not rendered worthless, and plans have been made for utilizing the metal when a new floor is placed on the quay.

ROLLERS OF NEW BEARING ARE STRUNG ON CHAIN

In machine design, where ball bearings of adequate strength would be undesirably large, engineers are now beginning to give consideration to the merits of a bearing of new type, called the "chain roller bearing." This bearing is small and compact because of its simplicity. There is none of the usual bulky parts for separating and guiding the rollers; instead they are hollowed, and are strung on the transverse members of a lightweight chain cage. The two ends of the chain cage, which now resembles a short length of bicycle chain, are brought together over a channeled steel ring, or race. A second ring encircles the rollers.



The New Chain Roller Bearing is Shown in Side View, in Cross Section, and as Disassembled for Inspection or Repair

MINERS KILL MOUNTAIN SHEEP TO MAKE "SPOONS" FROM HORNS

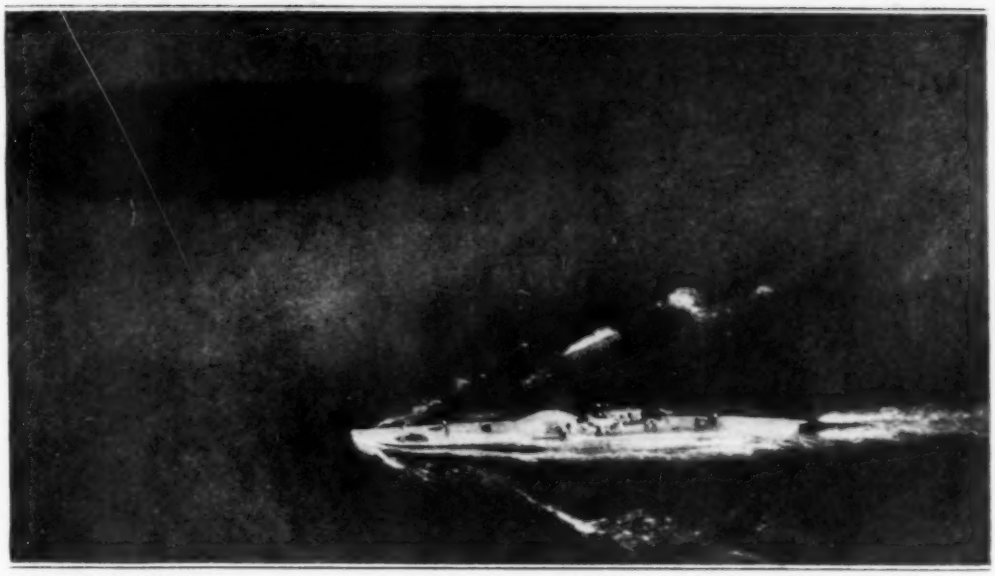
The American mountain sheep, or bighorn, is facing extinction, it is declared, because the laws of most western states permit a traveler in mountains or desert to kill, for his own sustenance, any wild animal, even though that animal is ordinarily protected by law. The mountain sheep are being killed, however, not for food, but for their hollow horns. From these the miners and prospectors fashion what they call "hornspoons" for the dry panning of gold-bearing gravel. The horn of the mountain sheep is not smooth within, but is overlaid with a maze of

One of the Prospector's Hornspoons, Made from the Horn of the Mountain Sheep, is Shown in Exterior View at the Left. The Interior is Seen at the Right

bony cells and ridges. So, as the gravel is shaken about in the spoon, the dirt, sand, and pebbles are caught in the cells of the sides. The gold, being heaviest, remains in the bottom of the spoon.

PORTABLE CLINICS TO CARE FOR CITY'S YOUNG

For the first time in its history the city of Philadelphia, Pa., now has a comprehensive system of portable health clinics for the children of the poor. These clinics are held once each week in eight of the city's recreation centers under the direction of the Health Council and the Tuberculosis Committee, and with the coöperation of various charitable, medical, and dental organizations. The program calls not only for physical examination of ailing children, but also for the instruction of parents in the values and preparation of food.



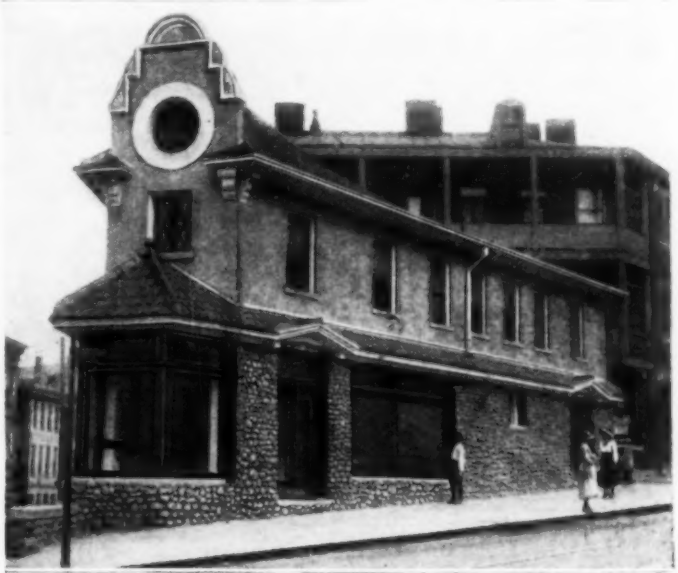
COPYRIGHT, KADEL & HERBERT

PHOTOGRAPH FROM DIRIGIBLE CATCHES SUBMARINE AND BLIMP'S SHADOW

AN interesting photograph was snapped by one of the crew of the "C-10," the United States Navy's newest dirigible, as during recent maneuvers off the Atlantic coast the airship was passing over submarine "R-8." The underwater vessel is seen to be cruising on the surface and at high speed. Members of the crew can be distinguished on the deck. Close to starboard of the bow is seen the fishlike shadow of the "C-10" itself.

VENEER OF ROCK AND STUCCO REHABILITATES EYESORE

An ugly building of red brick once defaced the "flatiron" corner formed by the intersection of two sharply inclined streets in Cincinnati, Ohio. Though the building was an oddity, because it stood three stories high on one street and only two on the other, it was nevertheless an eyesore. It is now a structure of considerable architectural dignity however, as a result of alterations made not long ago. These alterations were virtually additions, in that they consisted in veneering, or incasing, the weather-beaten old building in new walls and roof. The walls of the first and second story on one street, and of the first on the other, were hidden behind new surfaces of cement and prairie rock. Surmounting this was placed an ornamental, lean-to roofing of colored tile. The walls of the top floor disappeared behind several applications of stucco; while the roof, finally, was re-covered with more of the artistic tile.



This Peculiarly Shaped Building, Formerly a Weather-Beaten Eyesore of Red Brick, was Rehabilitated Recently by the Application of a Veneer of Prairie Rocks and Stucco. Colored Tile Covers the Roof

SHOCKER FOR GRAIN FIELDS SAVES MUCH FARM LABOR

Actuated by the growing dearth of field labor in the great wheat region of western Canada, a farmer of that district has designed a machine which, attached to a binder, automatically forms and deposits compact shocks of grain in the field. A large ground wheel furnishes the power. Sheaves from the binder pass up a conveyor into a hopper, and then, head down, into a conical basket with spring arms that adjust themselves to the size of the shock. When the driver pulls a lever, the basket turns over, and the shock is deposited, base down, solidly upon the ground.

By Attaching the New Machine to the Binder, as Above, the Farmer is Enabled to Cut and Shock His Grain Simultaneously. The Conical Basket is Seen in the Foreground. Below, the Machine is Seen in Side View

BY COURTESY OF THE SASKATOON STAR

AMERICAN SHIPYARD PREPARES FOR BIGGER BUSINESS

There is cheer for those who fear that American shipyards are about to revert to a state of rusty inactivity in reports from the city of Chester, about 10 miles down the Delaware River from Philadelphia, Pa. Here one company is hiring 3,000 more men, and is spending $3,000,000 for improvements and additions, among the latter an enormous wet basin.

NEWSPAPER SOUNDS CURFEW FOR MOTORISTS

Because of the congested traffic conditions of downtown Los Angeles, the city recently passed an ordinance which prohibits the parking of vehicles for longer than two minutes between the hours of 4 and 6:30 p. m. In the short time that this ordinance has been in effect, so many motorists have been arrested that a Los Angeles newspaper has come to their aid. The majority of the violators of the no-parking law have pleaded carelessness, or oversight, in leaving their machines on the streets during the forbidden hours. Accordingly, the daily has arranged to sound a powerful siren which can be heard throughout the business district at 3:50 every afternoon. This warning, 10 minutes before the no-parking law becomes effective, is a signal to citizens to get their cars out of the congested district before they find a tag on their steering wheels ordering them to report to police headquarters.

AUTO-RADIATOR DRAIN COCK CANNOT BECOME CLOGGED

Probing the drain cock of an automobile radiator to start the flow is a familiar operation, and frequently it clogs up again, and the draining process is not completed. A new form of cock has a tubular body extending up into the radiator, with an elongated aperture at one side, and a conical passage, a construction that is declared to eliminate all clogging and to assure free flow and complete drainage. Though designed for automobile radiators, the drain cock is well qualified for attachment to other liquid containers.

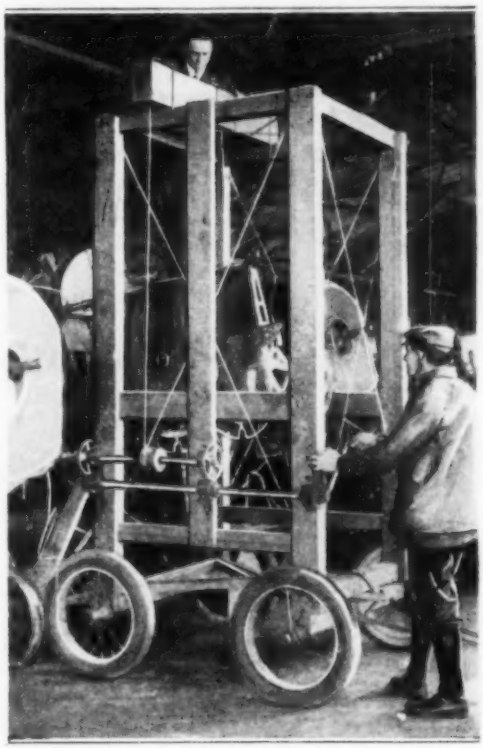
In the Background is Seen the Ridge Which has Given the Name "Backbone" to the 1,200-Acre Tract Which was Recently Dedicated as the First of the State Parks to be Established in Every One of Iowa's 99 Counties

IOWA TO OPEN STATE PARKS IN EACH OF 99 COUNTIES

A beautiful, wooded tract of 1,200 acres, called the "Backbone" because of the straight, narrow ridge which dominates it, and located on the Maquoketa River, near Manchester, was recently dedicated with full ceremony as the first of the parks to be opened by the Iowa State Conservation Board as part of their newly adopted program. This program calls for the establishment of at least one state park in every one of the 99 counties of the Hawkeye state, and of others as seems desirable. Three kinds of public playgrounds are to be acquired and opened. The first group will embrace parks of peculiar scientific and historical value, like the "Backbone" mentioned above; the second, small parks near communities and fit for the use of picnic parties, and the third, parks along the shores of lakes and rivers. Purchase of these shore areas will give the public access to many bodies of water which it can visit today only by violating the state's trespass laws.

SPECIAL HOIST LOWERS MOTOR INTO NOSE OF AIRPLANE

For the delicate work of lowering into place and alining airplane engines, an engineering officer of a western air-service station has contrived an unusual hoist. It consists of a sturdy, boxlike frame, about 10 ft. high, with one side left unbraced to permit the intrusion of the airplane nose. The frame is mounted on four rubber-tired wheels for easy conveyance about the hangars and shops. Across the top of the frame is a crosspiece from which depends the hoisting cable. As precision of alinement is essential, the windlass, fastened to one side of the frame, is so geared that the mechanic must turn the crank several times to produce any appreciable movement of the



This Hoist, Made Especially for the Work of Mounting Airplane Engines, is So Geared That the Engine can be Moved the Tiniest Fraction of an Inch

suspended engine. In consequence, the operator, in the last stages of the work, is able to elevate and lower the engine by the tiniest fraction of an inch.

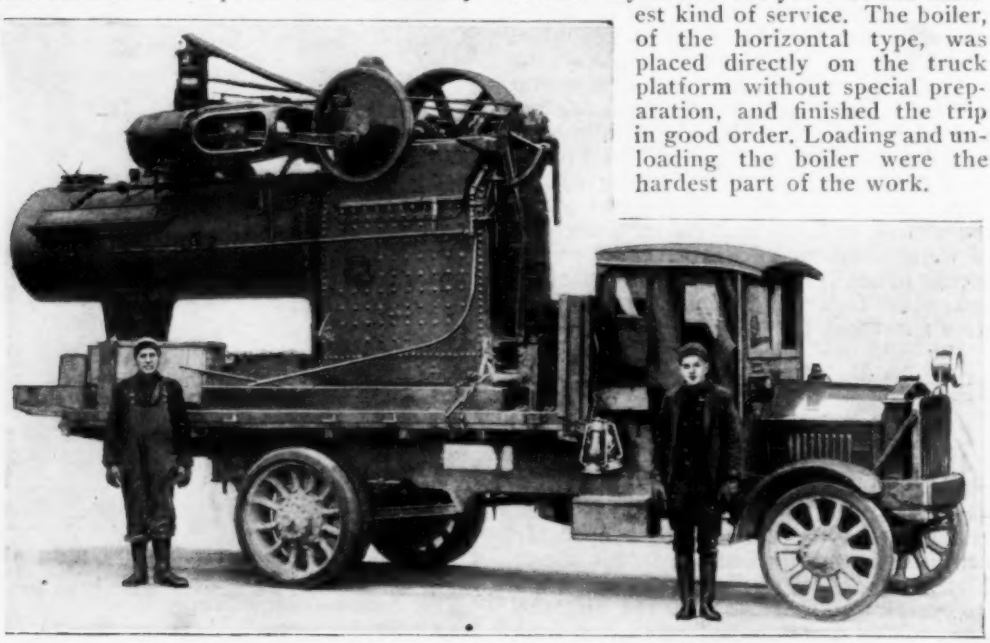
SEMIAUTOMATIC ARMY RIFLE DESIGNED BY OFFICER

All tests so far made have been successfully met by a new type of semiautomatic army rifle, designed by an eastern officer to accord with the weight, lines, and balance of the present-standard army small arm. The automatic mechanism, devised some years ago but never successfully applied, consists of a cap fitting over the muzzle, with a center opening for the bullet's exit. A hollow rod containing a spring extends from the cap to the breech. Upon firing, the expanding discharge gases, following the bullet, press the cap forward. The rod releases the breech mechanism, which recoils, ejecting the shell. The spring then raises the magazine clip, inserts another cartridge, and returns the breech to position. The gun thus fires at each pull of the trigger, without further effort, at the same time allowing steady sighting for each shot. The recoil is reduced 20 per cent, and the weapon is as accurate, and balances as well, with the automatic feature as without it.

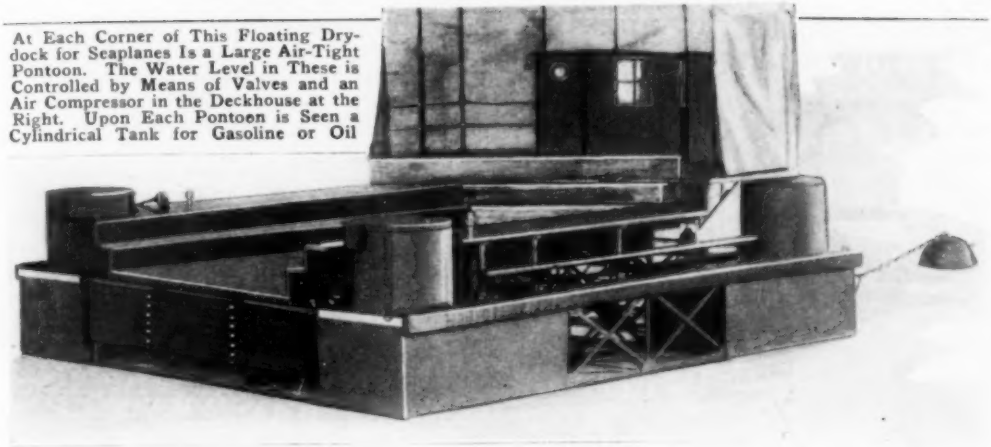
The New Semiautomatic Army Rifle, of Standard Weight and Shape: The Mechanism is Actuated by a Cap over the Muzzle

EIGHT-TON BOILER CARRIED SEVENTY MILES ON TRUCK

An engine boiler weighing 16,200 lb. is no ordinary load for a motor truck, without trailer assistance, even on city streets. Carrying such a burden over 70 miles of country road is something of a transportation feat, and the ease with which an Ohio hauling concern disposed of the job testifies to the reliability of the modern truck. The one used, far from being new, had already seen three years of the hardest kind of service. The boiler, of the horizontal type, was placed directly on the truck platform without special preparation, and finished the trip in good order. Loading and unloading the boiler were the hardest part of the work.



Without Preparation This Eight-Ton Engine Boiler was Placed upon the Motor Truck, and Carried over 70 Miles of Country Road. Far from Being New, the Truck Employed had Already Seen Three Years' of the Hardest Kind of Service



At Each Corner of This Floating Drydock for Seaplanes Is a Large Air-Tight Pontoon. The Water Level in These is Controlled by Means of Valves and an Air Compressor in the Deckhouse at the Right. Upon Each Pontoon is Seen a Cylindrical Tank for Gasoline or Oil

FLOATING DRYDOCK DESIGNED FOR HANDLING OF SEAPLANES

Phenomenal as has been the development of the seaplane since Curtiss first rose from and landed on water, in 1911, little attention has been devoted to the incidental but important problem of mooring and handling these craft. During the war the planes were usually launched from small cars, pushed from the hangars and into the water by brawny mechanics. This involved a wetting for the men and, sooner or later, rough handling for the plane. Recently, however, the problem has been attacked by a prominent British airplane manufacturer, with the result that patents have been issued for an interesting floating drydock.

The dock consists basically of four air-tight pontoons which form the corners of a flat, rectangular steel framework. Hereon is built a wooden floor to receive the hull of the seaplane. Along the sides extend elevated platforms for the convenience of the workmen and airmen. At the bow is a deckhouse containing an air compressor, and a high canvas wind screen. When the floating dock is to be used, it is towed to the location desired, anchored, and sunk two or three feet by admitting water to the pontoons. The seaplane is warped into position. The air compressor is now started, water is driven from the four pontoons, and the floor of the dock rises clear of the water.

¶Ten films depicting American methods of breeding live stock and handling meat have been purchased from the U. S. Department of Agriculture for educational use in the Argentine.

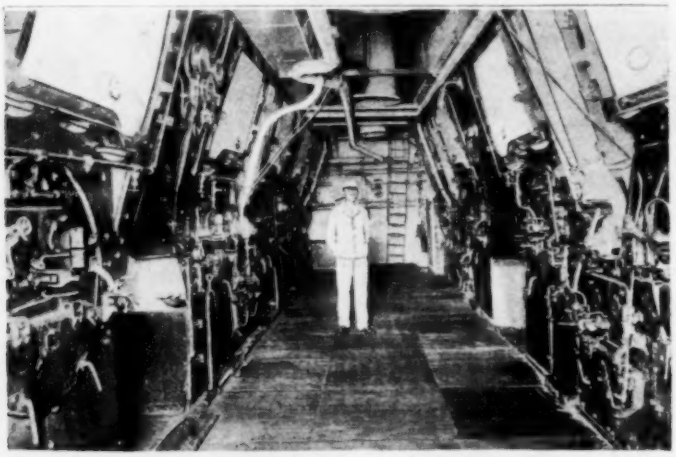
LARGE TREE ON ROOF REMOVED WITHOUT DAMAGE TO HOUSE

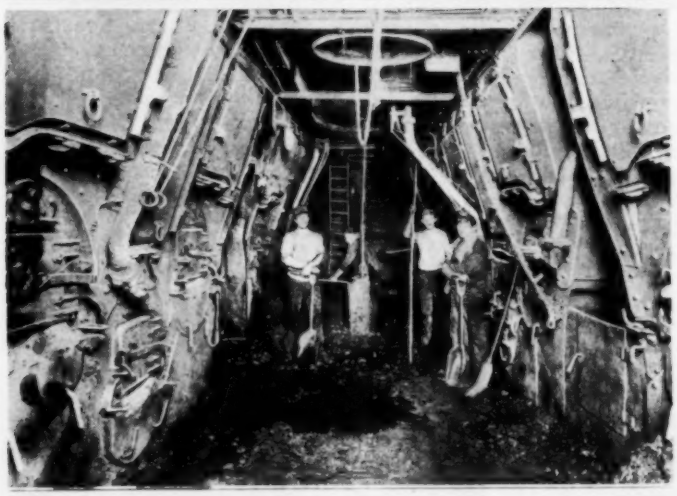
The expense of removing a towering cottonwood tree which had fallen upon a two-story house in a city of North Dakota during a recent windstorm was, oddly enough, far greater than the damage done. This was so because the tree broke about 15 ft. from the ground, and having fallen, remained like a massive girder from the stump to the roof of the house. Hasty removal of the tree in the obvious way would have entailed damage to the house. Accordingly, a cradle of four-by-fours was erected beneath the trunk, while the foliage and small branches were hacked off and thrown from the roof. By means of block and tackle, then, the trunk was raised clear of the house. The heavy branches were now sawed off one by one, making it possible, at last, for the workmen to lower the trunk to earth.

In Order to Remove This Fallen Tree without Damage to the House, the Heavy Staging was Built beneath the Trunk

CONVERSION TO OIL BURNING TRANSFORMS SHIP'S FIREROOM

The surprising statement, made recently, that coal fuel on large vessels will soon be as obsolete as wood, takes on plausibility when one hears of the unanimity with which steamship operators are now abandoning coal for oil. An official of a company engaged in this conversion of coal-burning ships announced a few months ago, in fact, that his organization had already installed nearly 700 oil-burning systems on American and other vessels, and was in possession of orders for similar work on ships of all the big American companies.



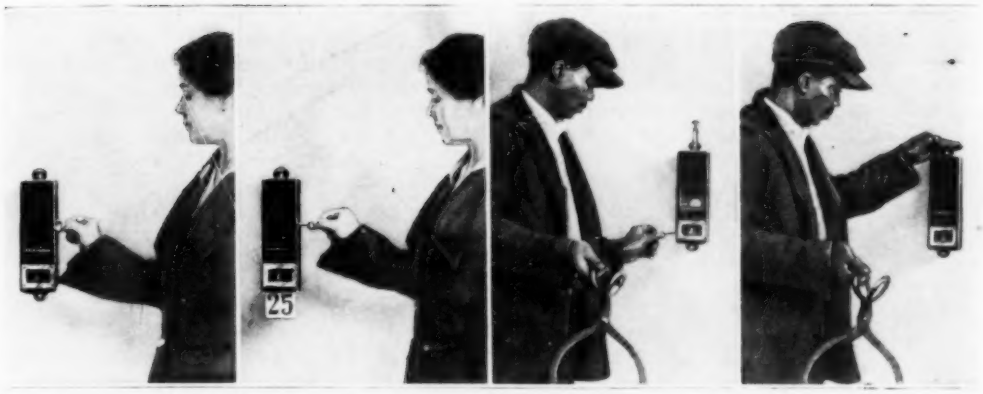


These Photographs of the Fireroom of an American Coastwise Steamship Illustrate the Change Wrought by the Substitution of Fuel Oil for Coal. Below: The "Black Squad" as It Toiled in the Clinker-Strewn Inferno. Above: The One Fireman Who Now Maintains the Same Number of Fires

To convey to the reader unfamiliar with the operation of large water craft the really revolutionary nature of this change, there are printed herewith two photographs depicting the fireroom of an American coastwise steamer before and after conversion. The eye gets the contrast at once. Yet the vanishing of the grime of the old-time stokehold is only an incidental result of, and argument for, the change. The more important advantages of oil over coal are the ease with which it is transported and stored, the facility with which it is bunkered, and the elimination of a fraction at least of the operator's labor difficulty.

FAMOUS ENGLISH GREENHOUSE DEMOLISHED WITH EXPLOSIVES

The celebrated horticultural conservatory on the ducal estates at Chatsworth Hall, near Manchester, England, collapsed with a roaring of high explosives a few weeks ago—as surely destroyed by the world war as any French or Belgian structure on the western front. It was demolished, in short, because the titled owner felt himself unable to maintain it, much less to pay the burdensome post-bellum tax now levied by Britain on all such luxuries. It was the post-bellum cost of labor, likewise, that compelled the use of explosives for the work. The glass house was erected in 1836-40, and served as a model for the great Crystal Palace still to be seen near London. It was itself of no mean size, measuring, as it did, 277 ft. long, 123 ft. wide, and 67 ft. high. Forty thousand panes of glass formed the arching walls and roof. The architect was Joseph Paxton, known to English school children as the humble gardener's boy who achieved professional renown, knighthood, and a seat in parliament. At the time of the erection of the Chatsworth-Hall conservatory, he was superintendent of this and other ducal estates.



The Housekeeper is Ordering and Paying for Her Ice, at the Left by Means of the Odd Cash Box. Having Delivered the Ice, the Iceman is Opening the Box, at the Right, to Obtain the Money, and Then Closes It

ODD CASH BOX IS GO-BETWEEN FOR HOUSEKEEPER AND ICEMAN

A small boxlike mechanism which, when fastened to the wall of the kitchen porch, serves both as a signal and as a cash box, is now finding favor with housekeepers and ice companies in the South. In appearance and operation it is not unlike an ordinary letter box. When the housekeeper desires to replenish her ice chest she causes a metal plate to fall into view from the bottom of the box. This metal plate displays the number of pounds desired. Into a slot she then drops the proper coin or coins. Observing the plate, later in the day, the iceman stops his wagon and brings the amount of ice requested. With his master key he then opens the box, so retracting the metal plate, and pockets the housewife's money. Pressure on a vertical plunger at the top closes it.

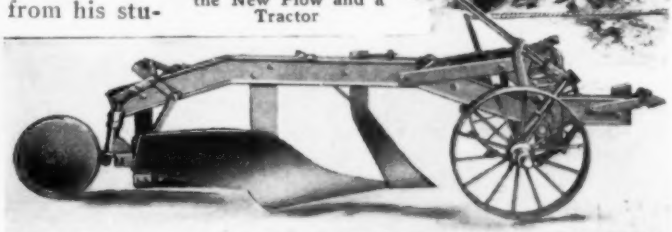
COLLEGE PROFESSOR CONDUCTS CLASSES BY WIRELESS

Temporary separation from his classes by 110 miles did not prevent a college professor, recently called from Iowa to Missouri, from assigning lessons as usual and receiving daily reports from his students. On the campuses of both his own school and the one he was visiting wireless stations had been erected, in charge of ex-army men, and the professor experienced no difficulty in communicating his instructions and keeping the classes properly busy during his absence.

HEAVY GRUBBING PLOW CLEARS LAND OF ROOTS AND STONES

Drawn by a tractor of 12 to 20 hp., a heavy grub-breaking plow, now offered by a Wisconsin concern, is declared to be remarkable for its ability to remove all roots and stones from rough land. A 24-in. clearance between the plow point and the double steel-channel beam prevents clogging, even in tangled marsh bottoms. To strengthen the plowshare, a second share is bolted to it and welded to the landside. The plow is lifted, front and rear, by a power connection, controlled from the tractor by a cord, but is equipped with a hand-lift lever to be used in case of emergency.

Grubbing a Tangled Swamp Bottom with the New Plow and a Tractor



A Side View of the Grub-Breaking Plow, for Removing Roots and Stones from Rough Land: By Means of the Cord at the Right, the Plow may be Lifted, Front and Rear, by Power from the Tractor

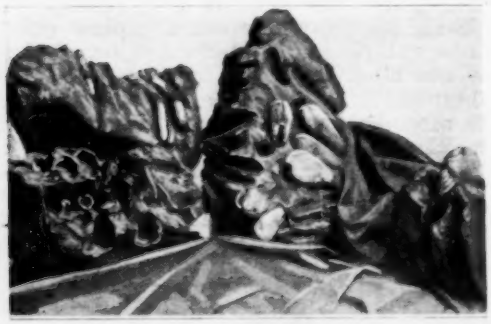
TREE OF GLACIAL AGE DUG FROM ASPHALT PIT

A cypress tree, exhumed from a small asphalt pit in southern California, has lately been identified by the curator of a Los Angeles museum as a relic of the Pleistocene or Glacial Age. As such it was contemporary with the mastodon, the saber-tooth tiger, and the giant ground sloth. The find is considered the more remarkable because no living specimens of the cypress are to be found in the vicinity. The tree is in an excellent state of preservation, too, thanks to the action of the enveloping tar. The bark is intact in many spots, and is unchanged except for the discoloration incident to long contact with the bituminous matter of the pit. The tree lacks its roots and smaller branches, but two of the larger are still to be seen.

This Tree was Dug from the Asphalt Pit in the Background, and has Lately been Identified as a Relic of the Glacial Age. The Bark Is Intact in Many Spots and is Unchanged Except for Discoloration Incident to Long Contact with the Bituminous Matter of the Pit

OYSTERS IMBEDDED IN ROCK ARE PACIFIC CURIOSITY

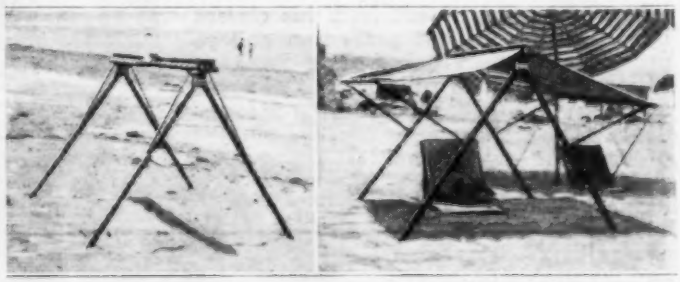
Edible oysters that live with their shells imbedded in solid rock, like the fossils of some extinct creature, have been discovered in Coos Bay, Ore. The fact that they are fairly abundant makes these strange mollusks no less a curiosity, and the university of the state is now engaged in a study of their origin and mode of life. Because they are considered an exceptionally delicious food, the investigators are also examining into the possibility of their propagation for the market.



Fragments of Rock in Which the Shells of Live Oysters of Curious Form are Imbedded. They were Discovered in Coos Bay, Oregon

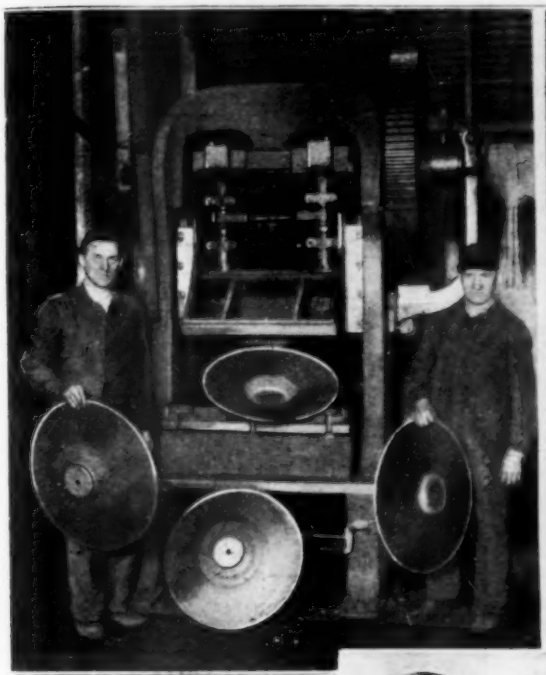
BEACH SHELTER COLLAPSES COMPACTLY AFTER USE

A beach parasol, or tent, of new design is in use this summer at several beaches along the Pacific coast. As rented from the proprietor, the tent is seen as a bundle of slender, hinged poles, about six feet long. As these are unfolded, it is found that four of them are legs, which support between them a ridgepole. On either side of this ridgepole is a spring roller on which is wound a canvas awning. Pulled outward, and braced against retraction by their wire supports, these two awnings form a roof which offers ample protection against the sun.



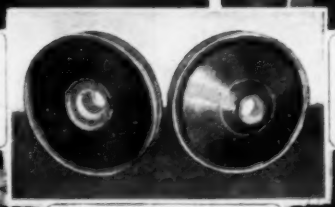
The First Step in the Erection of the Collapsible Beach Shelter is Portrayed at the Left. The Awnings are Pulled Out to Form the Roof, at the Right

STEEL-DISK AUTO WHEELS MADE BY WELDING

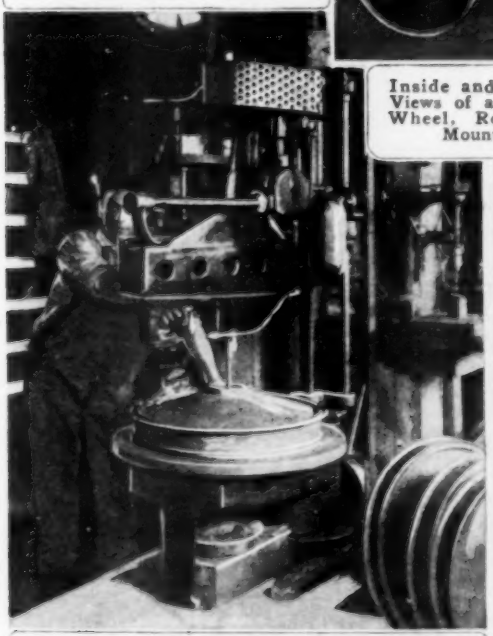


Steel Plates for the Outside and Inside of Double-Disk Auto Wheels are Stamped Out, 100 a Day, by Two Operators with This Big Press

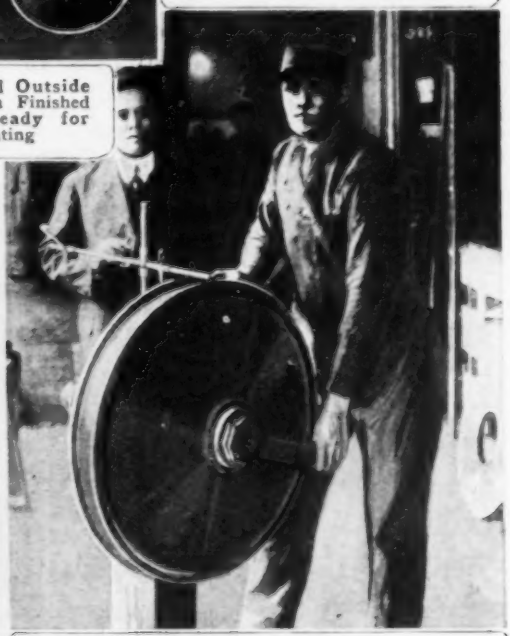
The Welding Machine, in Which the Two Disks, the Rim, and the Hub Shell are Made a Single Unit, Finishing 25 Wheels a Day



Inside and Outside Views of a Finished Wheel, Ready for Mounting



The Final Operation in the Manufacture of Auto Wheels from Two Steel Disks: The Machine Finishes 50 Outer Hubs a Day



Inspecting the Finished Wheel, Mounted on an Axle-Hub Assembly: It must Have True Balance and Perfect Alinement to be Accepted

KNITTED ONE-PIECE GARMENT IS NEW FASHION FREAK

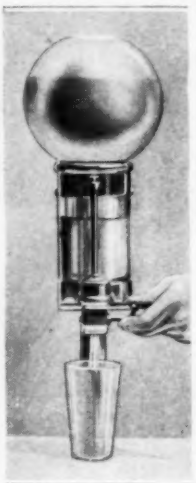
The most hardened boulevardiers batted an eye recently when a Parisian mannequin appeared in the bizarre costume illustrated on this page. The garment is composed of a single piece of knitted wide-meshed fabric. Brought together in the back, it forms wide, kimono sleeves. These are trimmed with heavy fur; another band of fur encircles the garment at the height of the knees. A close-fitting turban completes the costume.

FORMS TUBES AND MOLDINGS FROM FLAT METAL STRIP

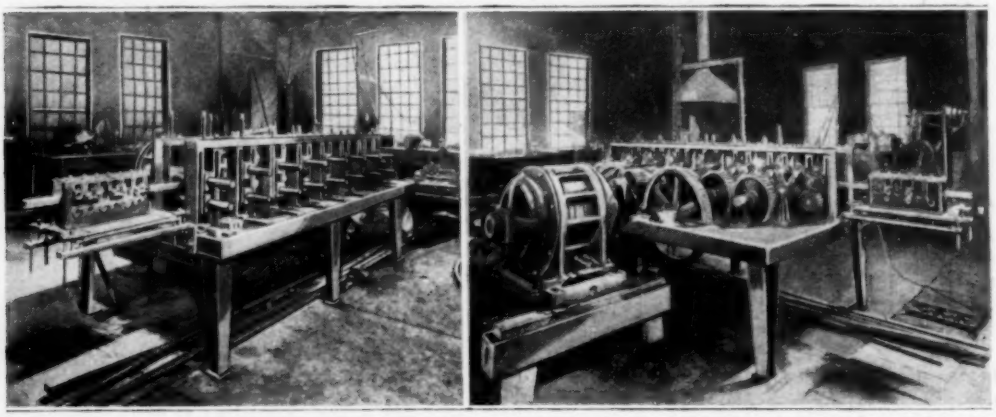
Either tubing or molding of any desired shape may be made at the rate of 50 to 200 ft. a minute, from flat metal strip up to 13 in. wide, by a machine now manufactured in Ohio. The shaping operation is performed gradually by a series of eight pairs of roll dies, all of which are driven by gears. A large vertical adjustment of the upper-roll spindles is possible, accommodating various sizes and shapes, and allowing for regrinding of the dies. Open-joint, lock-seam, or welded tubing can be produced, and provision is made for electrically welding one flat strip to the end of another, to assure continuous operation without interruption. Slight graduation of the roll sizes maintains a tension that prevents buckling of the stock, and a set of straightening rolls at the end finish the product by smoothing out any possible kinks or irregularities.

DISPENSER OF BOTTLED GOODS MEASURES AMOUNT SERVED

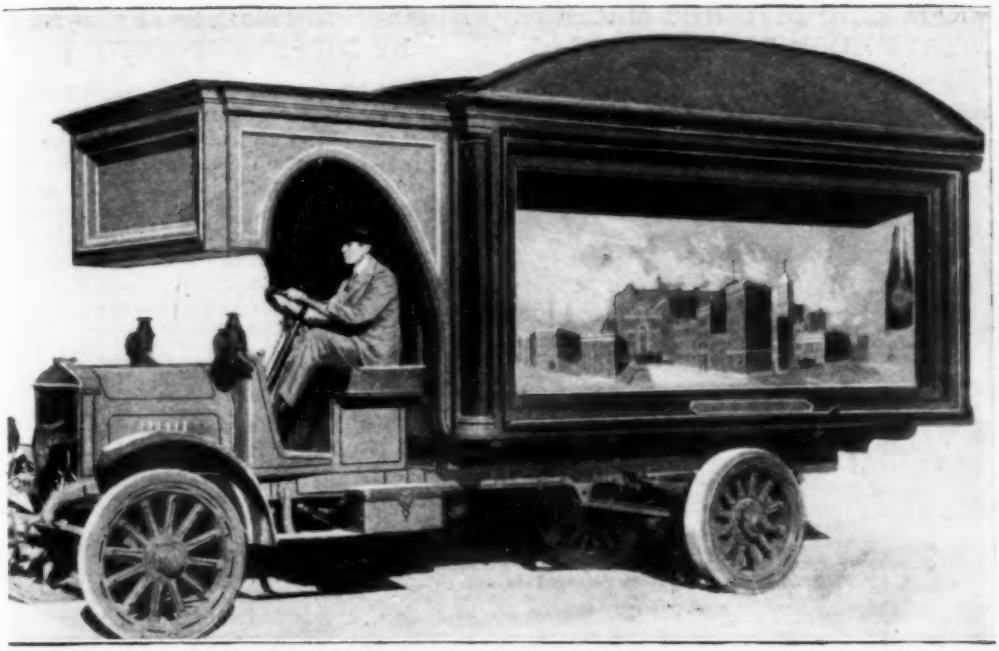
The customer's drinking glass receives a definite and measured amount of grape juice or other beverage, when it is filled at the faucet of a counter dispensing machine invented in the East. The original bottle of liquid is inverted in the top of the dispenser, and a measuring chamber below holds the charge of refreshment for each glass. A piston with a hollow graduated stem adjusts and indicates the capacity of the chamber.



¶Approximately 4,000 Parisian taxicabs are now upholstered in American army olive drab as a result of the proprietors' discovery that the cloth could be purchased more cheaply than French material.



Left: Front View of the Machine for Forming Tubing and Molding from Metal Strip, with the Straightening Rolls at the Near End. Right: The Gear Side of the Machine, Showing the Driving Motor



Motion-Picture Advertising Truck, Carrying a Large Screen and Projector, and Remarkable for Its Two Huge Flood-Lighted Billboards, One on Either Side of the Body

TRUCK CARRIES BILLBOARD AND MOVIE APPARATUS

One of the national advertisers of soft drinks utilizes a unique motor truck advertising campaign. This car visits the leading cities of the country and puts on demonstrations before thousands of people each day.

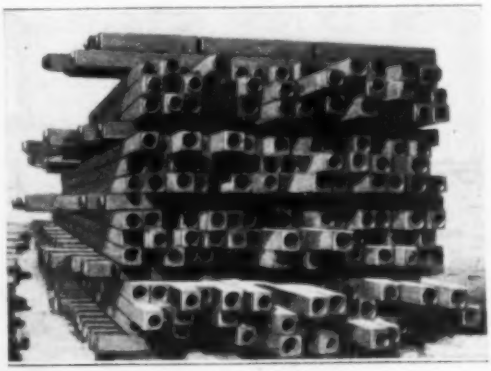
The motor truck carries two 4 by 10 ft. billboards on either side of the body, flooded with light at night to attract attention. On these billboards are pictures of various plants of the company. Their truck is equipped with an electric lighting system, and the brilliant lighting of the billboards, together with their size, color, and general appearance, attract attention both day and night.

The truck is also completely equipped for giving outdoor motion pictures, which, while their fundamental purpose is to advertise the products of the company, are of a nature that entertain as well as instruct. On the top, across the front, is an iron frame supporting a transparent screen 6 by 8 ft., and as the projector is lower down and at the rear, this gives a two-way view of the pictures.

¶ The occupants were killed when an airplane struck the high-voltage wires beside a San Francisco airdrome, recently, and crashed in flames.

CAST-IRON PIPES ARE SQUARE IN EXTERIOR CROSS SECTION

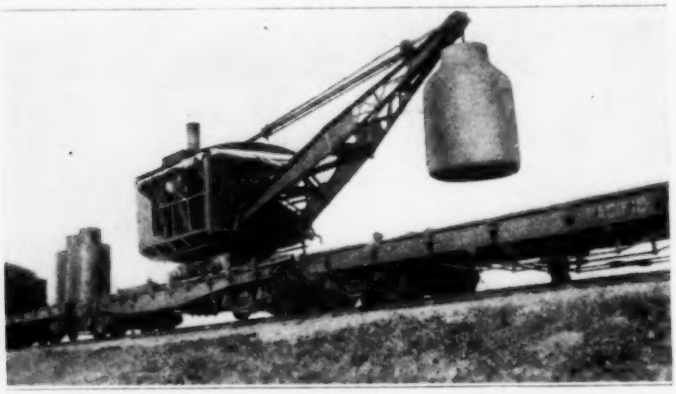
In the construction of yard buildings for one western railroad, the builders are now using an unusual type of water pipe. The pipe sections are of cast iron and are fitted together in the usual way. The exterior is square in cross section, however, in order that the pipe may be incorporated in walls and floors like any structural element. The thick walls of the pipe will carry safely any ordinary load imposed on walls or floors, into which they have been built.



These Water Pipes, Square in Exterior Cross Section, are Used in Construction like Any Structural Element

RAILROAD DITCHING MACHINE SETS HUGE BATTERY WELLS

A curious use for a railroad ditching machine was developed when, on a recent occasion, a number of the huge battery wells used for block-signal installations had to be unloaded from flat cars and set in place. By removing the bucket from the ditcher, its boom was converted into a derrick, an oak block being wedged into the neck of each of the fragile 5,000-lb. jars for a hoisting grip. The ditcher then moved along the flat cars on its own portable track, lifting the wells out of the way as it progressed, or hauling them within reach from a distance by means of a loop in the cable. In 10 hours a total of 32 wells were unloaded and set.



The Railroad Ditching Machine, Running on Portable Rails on the Flat Cars, is Seen Lifting a 5,000-Pound Battery Well from the Car by Means of an Oak Block Wedged in Its Neck

CHICAGO TO HAVE CENTRAL PARCEL-POST STATION

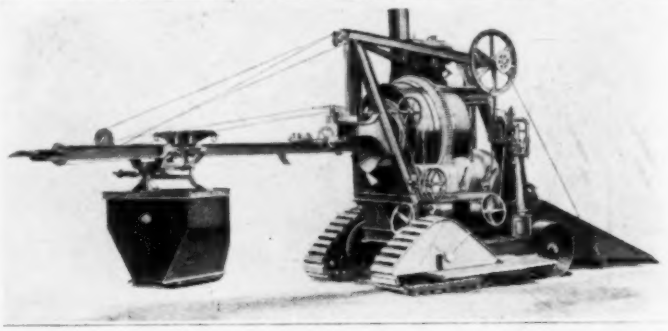
A large building designed solely for the handling of parcel-post packages is soon to be erected a few blocks from the central post office at Chicago, Ill., in order to relieve the congestion which now overwhelms the old building. The new structure will be four stories high, will cost about $650,000, and will be occupied by the government under a 10-year lease. At the end of this term, it is hoped work will have been completed on the magnificent post-office building conceived with the new Union Railroad Station.

NUMBER BRITISH PATENTS NOW BY DIFFERENT METHOD

Adoption by the British patent office of a new system of numbering patents, and abandonment of the old method of using the same number for both application and patent, appear to have created some confusion among American inventors. Under the new arrangement, the number of the application is not to be used in describing or marking the patented article, only the actual patent number, of a series which began with 100,000, being so employed. The old system started with 1 each year, and the patent when issued took the same number as the application, a method which left vacancies in the list when applications failed of completion.

TRAVELING CONCRETE MIXER HAS TANKLIKE TREAD

A concrete mixer that follows its work about is now being marketed by an Illinois concern. Endless-tread traction members, in place of ground wheels, enable it to negotiate rough ground, and a swinging boom with traveling bucket, which may be quickly replaced by a swivel chute, permits the concrete to be delivered at any desired point. The machine has only 11 gears, and is controlled by four levers and four handwheels. It is light enough to be hoisted readily to the upper floors of buildings.



A Concrete Mixer That Travels with Its Work on Endless Treads: The Swinging Boom and Bucket may be Replaced by a Swivel Chute, and the Whole Machine may Readily be Hoisted into a Building. It is Controlled by Four Levers and Four Handwheels

CAÑON ROAD ON OLD RAILBED HAS TWO TUNNELS

When the railroad removed its tracks from Salina Cañon, in central Utah, it left as a legacy to the people of the region a most desirable wagon road. The existing road along the cañon side was little more than a twisting mountain trail; but this railway bed runs comparatively straight and level, going through obstructing hills, not over them. Salina Cañon's makeshift highway goes through two tunnels, in fact, one of them several hundred feet in length. Care is always taken to prevent head-on encounters in mid-tunnel, as both bores are only nine feet wide.

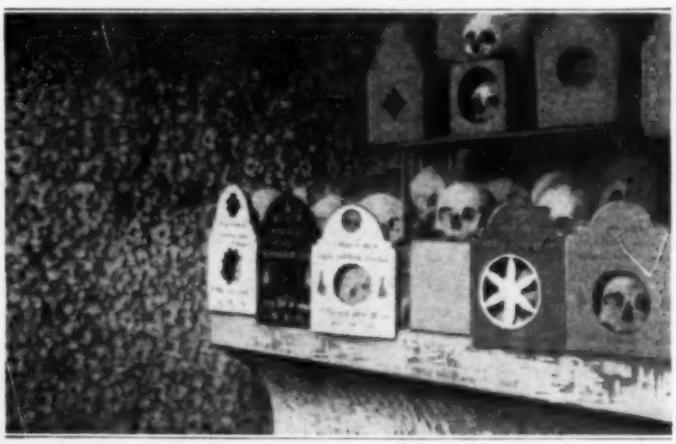
This Is One of the Tunnels Found along the Cañon Road. Formerly the Bed of a Single-Track Railway, the Highway Is Rather Narrow, but It Is Much More Convenient than the Old Mountain Trail

ANGLING SCENES IN MOVIES USE TINTED RUBBER FISH

Movie sportsmen who stalk into the picture carrying fly rods and strings of trout, apparently so freshly caught that their tails still wiggle, are not necessarily lucky fishermen. Until recently, film directors who needed angling scenes in their pictures were dependent upon the notoriously unreliable moods of living fish. But modern efficiency demanded a method more certain and less wasteful of time. A California picture concern therefore engaged a manufacturer of rubber to produce a string of accurately fashioned rubber trout, and an artist completed the verisimilitude by tinting the elastic fish, with oils, in nature's colors. The result is so satisfactory that only a close examination reveals the deceit, which defies discovery on the screen. The same factory and artist are now busy upon an order of yellowtail, tuna, and other salt-water fish for a series of sea pictures now in the making.

RELICS OF VERDUN MADE SPORT FOR HUNS

Near Verdun, France, are many curious little cells of clay, each perhaps a foot or 15 in. square, with an oddly designed window in the ornamented and inscribed front. In each cell, peering through the opening, is a human skull. These strange sarcophagi were made to pass the time away by the German soldiers who laid such long siege to the city. They did not lack for filling material. Within an area of two square miles about Verdun lie the bones of hundreds of thousands of French and German fighters—literally enough to pave the town. It is estimated, indeed, that approximately 1,000,000 soldiers died in and about the city.

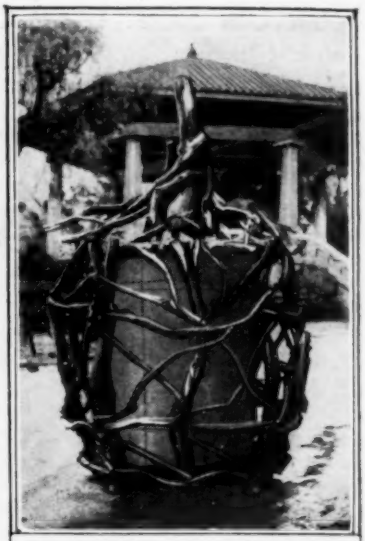


Behind the Window in Each of These Curious Cells of Clay, Made by German Soldiers, was Placed a Human Skull. Garnered from the Battle Fields about Verdun

GLIMPSES OF BEAUTIFUL AND UNUSUAL FEATURES

COPYRIGHT, PUBLISHERS PHOTO SERVICE

This Apartment House Differs Pleasantly from Its Neighbors in Design and Ornament. Over the Entrance are Suspended a Dozen Concrete Flowerpots



The Rubbish Cans in One of the Parks of Pasadena, California, are Camouflaged by Covers of Woven Twigs and Branches. The Top can be Lifted Off When the Can must be Removed

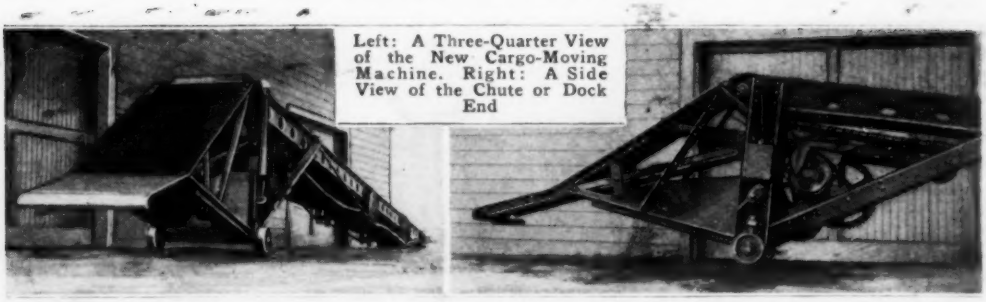
The Gardener, and Not the Sculptor, Designed the Monumental Lions That Guard the Portals of This Home. The Concrete Faces were Fixed to the Wooden Framework of the Bodies. Over These Ivy was Trained

Simple and Far from Ornate, the Little Footbridge Nevertheless Harmonizes Well with the Informal Beauty of This Japanese Garden. The Structure Consists of Two Arching Logs over Which has been Laid a Floor of Rough-Hewn Crosspieces

As the Garden Seems to Achieve Its Completest Beauty When It Serves as the Setting for a Gemlike Pool of Water, So the Pool is Best Loved When Spanned by a Graceful Little Bridge of the Owner's Design. This Structure was Built Entirely of Logs and Branches from the Grove in the Background

"The Oriole's Nest," as This Cozy Retreat is Sometimes Called, is Hidden in a Clump of Pine Trees at the Edge of a Great Lawn. Climbing Vines have All but Hidden the Lattice Framework

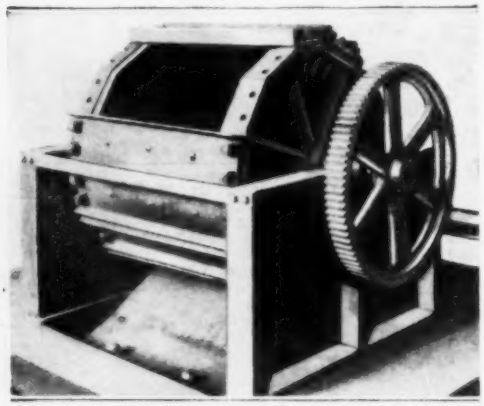
In This More Formal Garden the Mason's Trowel has Replaced the Carpenter's Hammer and Saw in the Building of the Ornamental Bridge. Concrete and Heavy Uncut Stones Were the Materials Used



Left: A Three-Quarter View of the New Cargo-Moving Machine. Right: A Side View of the Chute or Dock End

TEST PAVING BRICK QUICKLY WITH TUMBLING MACHINE

Specimens of paving brick may be tested for wear so effectively, in a simple machine devised by students of a western agricultural college, that an hour's trial gives the results of 25 years of normal use. The machine operates like a tumbling barrel or drum, with easily removable side panels for inserting and removing the samples. The specimen of brick to be tested is weighed and placed in the drum with a quantity of large steel shot. The proportional weight after an hour's run determines the quality.



Tumbling Machine for Testing Paving Brick, with Panels Removed for Insertion of Samples: The Brick to be Tested is Weighed and Placed in the Drum with a Quantity of Large Steel Shot

NEW UNLOADER TYPE IN USE ON OCEAN DOCK

A portable cargo-moving machine now in use at one ocean terminal contrasts with the ship's crane, which dumps a slingful of cargo upon the dock at intervals, in that it keeps the cargo moving without intermission from ship's deck to dock. The decks of the vessels using this dock are usually at dock level. The unloader is thrust across the ship's rail, accordingly, with one end on the deck and one on the dock. It is of the steel-framed, endless-conveyor type, with a 10-ft. chute or apron at the discharge end. Here, too, is the electric motor. Sacks, boxes, and other cargo placed upon the conveyor are carried to the chute. Down this they slide to waiting longshoremen.

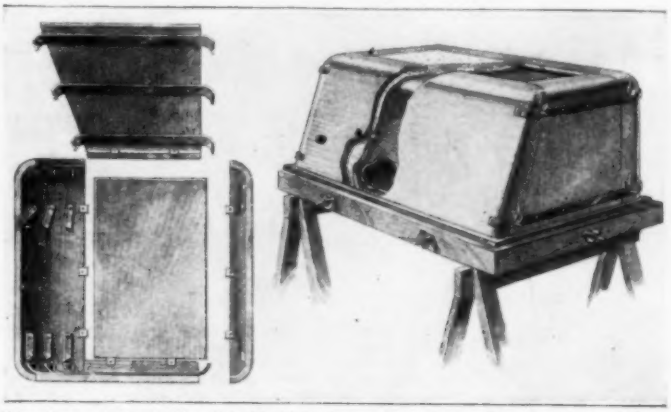
FOREST RANGERS FIND TREE BLAZED BY EARLY EXPLORER

Four blocks, sawed from an ancient Douglas-fir tree, were recently sent by forest rangers to the forestry museum at Portland, Ore., where they have since been installed as permanent exhibits. They are considered worthy of this dignity because each bears a blaze, or scar, made—study of the growth rings has shown—approximately 150 years ago. It was at this time, in 1774 and 1775 to be exact, that the Spanish navigators Juan Perez and Bruno Heceta made the first real explorations of the Oregon coast. Knowing this, and that the tree stood on a high point of land overlooking the Pacific, it seems not improbable that the blazes were carved by the knives of a landing party from one or the other of these expeditions.

Study of the Growth Rings Shows That the Blazes on These Blocks of Oregon Fir were Made at the Time of the Spanish Exploration Approximately 150 Years Ago

COLLAPSIBLE MOLD INVENTED FOR MAKING CONCRETE TUBS

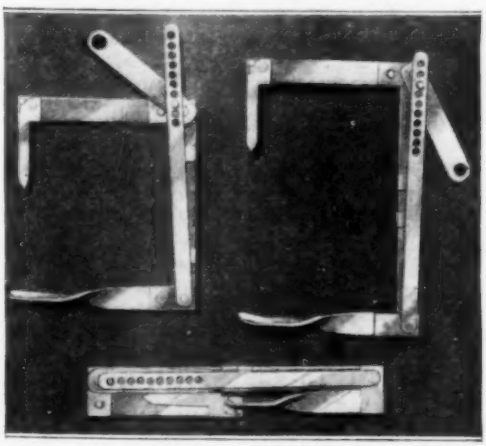
A mold which is rigid when assembled, yet is quickly removable in sections from the dried cast, has recently been invented for the construction of concrete laundry tubs, bathtubs, sinks, and similar fixtures. It consists of three major parts: a core, an outside form, and a foundation frame. The core consists of two side plates, with projecting cleats, a front and back plate with pins for corresponding holes in the cleats, and a bottom plate which rests, when the core is inverted, upon lugs projecting from the upright members. The outside form is of simpler construction, involving only four sides, which are latched together. To use the mold, the inverted core is placed within the foundation frame, with its edges resting upon bolts which project from the frame. The outside form is placed upon the frame, and the concrete poured into the space between core and frame. When the concrete is dry, the frame bolts are withdrawn, permitting the withdrawal of the core, piece by piece.



The Core of the Collapsible Mold is Seen at the Left. The Cut-Away View, at the Right, Illustrates the Use of the Mold

FOLDING AUTO-VALVE LIFTER CARRIES IN TOOL KIT

Tools that fold are likely to gain that desirable quality at the expense of rigidity. A folding valve-spring compressor and valve lifter for autos now on the market is so constructed, however, that it retains the positive alinement of a solid tool. It is made of cold-rolled steel, weighs 3 lb., and is strong enough for heavy work. The sliding yoke is adjustable to valve stems from 4½ to 9 in. long, and the valve fork is self-centering. The adjustment is made by shifting the fulcrum pin of the lever to different holes in a pivoted bar. There are 10 holes, one for every half inch. The folded tool is 14½ in. long.



The Valve Lifter is Seen in Two Positions at the Top and Folded for the Tool Kit in the Lower View

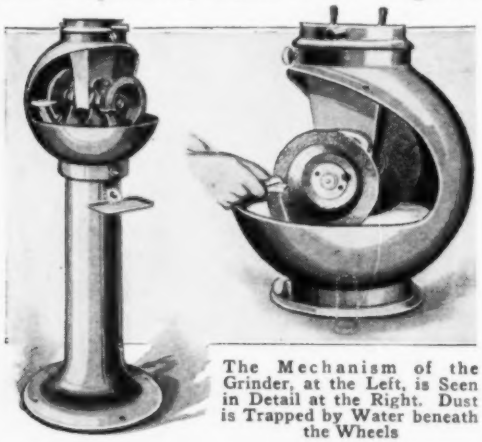
AUTO DEALER PROVES CLAIMS OF "MILES PER GALLON"

Since economy has become so strong a factor in the sale of motor cars, an Iowa dealer, determined to offer more than mere talk of "miles per gallon," has arranged a simple device to prove his claims. On the left windshield post of his demonstrator he has fastened a glass container, holding exactly one pint of gasoline. With the supply from the regular tank shut off, he fills the glass, and runs until it is empty, and the speedometer tells the figure of engine efficiency better than words.

¶Channel lights maintained by the United States Lighthouse Service were inspected from an airplane for the first time recently, when a keeper flew along, and close to the surface of, a long estuary in North Carolina. Though the day was bright, he was able to see whether or not the lights were burning.

WATER BENEATH GRINDING WHEELS CATCHES DUST

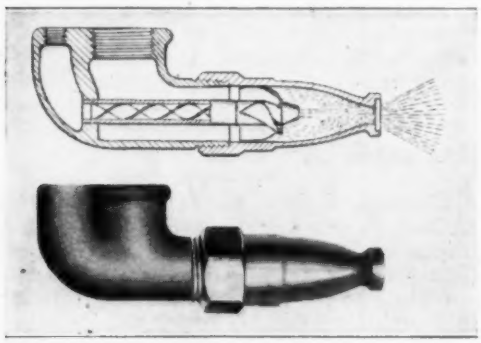
A new tool-sharpening machine is dustless in operation, thanks to the designer's inversion of the usual construction. The two grinding wheels are mounted, not in the ordinary way, but on a head which is suspended from the top of a globe-shaped casting. The globe is cut away enough to give convenient access to the wheels. The bottom, however, is left intact in order to hold the several quarts of water that catch and hold all particles thrown off during the grinding. Grinder head and globular casting both swivel on vertical axes, making it possible for the operator to work under the best possible illumination.



The Mechanism of the Grinder, at the Left, is Seen in Detail at the Right. Dust is Trapped by Water beneath the Wheels

NOZZLE MIXES TWO FLUIDS OR LIQUID AND GAS

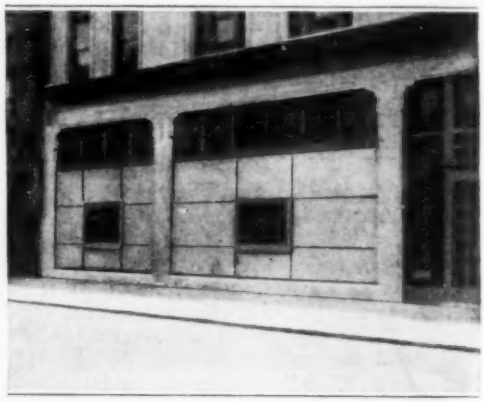
A complete and yet practically instantaneous mixture of two fluids is accomplished by a new form of nozzle, designed primarily for the chemical trade. The mixing chamber is in the head of the nozzle. The two liquids enter separately at the rear, one passing through an inner tube containing a spiral vane, the other traversing the annular passage around the tube and going through a propellerlike section. The whirling motion thoroughly combines them in a single spray. A liquid and a gas also may be mixed.



The Mixing Nozzle, with Its Spiral Vanes, is Seen in Section Above, and in Perspective Below

PANES IN WOODEN WINDOWS GIVE PEEP-SHOW EFFECT

Unable to procure plate glass for the two display windows, yet unwilling to delay the opening of his new quarters, the manager of an automobile agency in Brooklyn, N. Y., recently astonished the neighborhood with an odd makeshift. In the great window frames he had the carpenters place wood-paneled partitions. In the middle of each was then set a small glass pane. The curiosity of the passer-by seldom failed to draw him to one of the panes. Peering through the aperture, as through the orifice of an old-time peep show, he was surprised to see a spacious showroom, crowded with exhibits.



Unable to Procure Plate Glass of Sufficient Size, the Owner had the Carpenters Construct These Wooden Windows, with Small Panes Inset

¶Complete reconstruction of Chicago's present congested produce center, planned to begin in the early future, will give that city a food market asserted to be the largest and most modern in the world. The work involves moving all the buildings along South Water Street's river front, the double-decking of that thoroughfare, and the construction of a huge railroad terminal, into which produce cars will be brought directly. The improvements are expected to reduce local food prices and increase trade with other towns.

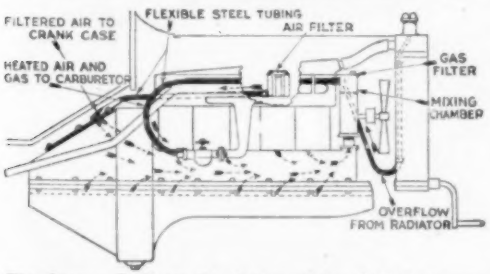
ARIZONA DESERT REGION GETS SOLAR OBSERVING STATION

Atop the Haqua Hala Mountains in the heart of the desolate desert region of Arizona, the Smithsonian Institution is now establishing another solar observing station. The work carried on here will be similar and supplemental to that of the institution's existing station at Calama, Chile, which for the last few years has been furnishing daily reports to the Argentine government. Like its Chilean predecessor, too, the new station is located in a practically cloudless area. This part of Arizona is believed, in fact, to be the most consistently cloudless region in the United States.

The labors of the Smithsonian scientists at this lonely spot are certain to prove fruitful. Already the observers have found that the amount of radiation from the sun varies not only from year to year, but also from day to day. Plotted, as by the Argentine government, the curves representing these daily variations are seen to resemble closely the curves depicting daily fluctuations from normal of the weather conditions.

CARBURETING SYSTEM DRAWS AIR THROUGH CRANKCASE

An odd carbureting system, recently patented for a well-known low-priced automobile, is said to increase mileage per gallon, while prolonging the life of the engine. The system draws air through a filter on the left side of the engine. Thence the air is sucked through a hole in the transmission cover plate; goes forward through the crankcase, and passes into a special cylindrical chamber over the breather. Here the air is mixed with

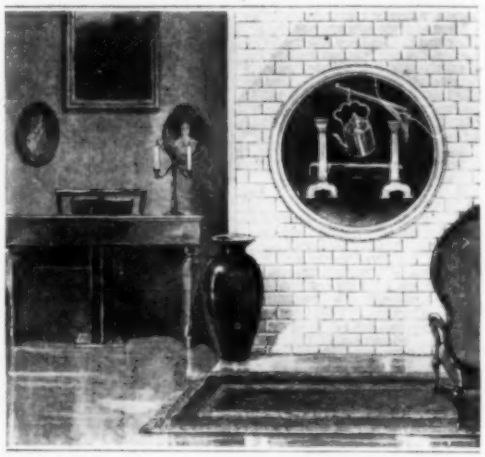


The Arrows Indicate the Action of the Odd Carbureting System, as Applied to the Engine of a Well-Known Low-Priced Automobile

live steam from the radiator overflow pipe. This mixture then passes over the exhaust manifold, which heats it further, and finally enters the carburetor.

CIRCULAR FIREPLACE MIDWAY BETWEEN FLOOR AND CEILING

In a house of the Civil War period, in western New York State, is to be found a fireplace that breaks every architectural



The Strange Fireplace Is Circular in Elevation, and is Built into the Wall Halfway between Floor and Ceiling

convention. The wall aperture is not rectangular, but circular. The fireplace itself is not built at floor level; instead, it pierces the wall just halfway between floor and ceiling. There is no mantel piece. The wall surface surrounding the circular opening is faced with gleaming white tile. Despite its form, the fireplace is declared to draw, and throw the heat surprisingly well.

SIMPLE AUTOMATIC WIRELESS FOR RAILROAD SIGNAL

Wireless transmission of the simplest and most elementary type is being put to effective use on French railroads for automatic signaling to the engine crews. An insulated antenna wire some 33 ft. long is stretched alongside the track at signal points, connected through a spark gap to an induction-coil secondary. The primary of the coil is connected to a length of insulated rail, and to ground through a battery and a signal-control switch. When a passing engine grounds the insulated rail, completing the circuit, the resulting waves are received by another antenna strung under the engine. A simple coherer, connected to a solenoid which operates the whistle, completes the system. The engineer is required to record his receipt of the signal by a special mark on the running record.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

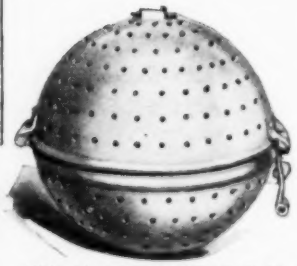
The Ice Shaver Above Has an Adjustable Saw-Tooth Blade, and being Made of Aluminum, Is Nonrusting and Light

The Traveling Case at the Right is Made of the Army Olive Drab and Has Pockets for Clothing, Towels, Toilet Articles, and Other Camping Necessities

The Collar Button Seen Above in Side View and Cross Section Has a Rubber-Covered, Spring-Mounted Back

Electric-Light Fixtures of a New Type, Illustrated Above, are Designed Not Only for Long Service, but for the Exclusion of Dust, Which in Two Weeks, It is Said, will Lessen the Efficiency of a Reflecting Surface by 45 Per Cent

The Inside of the Cover of This Wash Boiler is Provided with a Soap Shaver

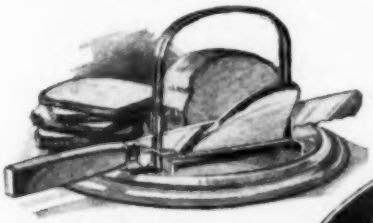


This Overgrown Tea Ball Is an Enameled Kitchen Utensil for the Boiling of Rice. The Cooked Grains Come Out Unbroken

This Artistic Revival of the Old-Fashioned Night Light Uses Little Wicks Which Float in Oil. The Flame will Boil an Egg

Composed of a Heel and a Toe Block and Two Screws, This Shoe Stretcher will Lengthen an Uncomfortable Shoe

This Movable Inclosure, or Pen, for the Baby Has a Removable Folding Floor, and can Itself be Folded to Small Compass



This Bread-Cutting Set Comprises a Board, a Knife, and a Rack Which can be Folded Down

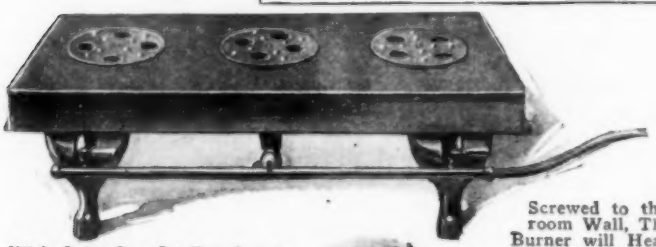
A Safety-Razor Blade Forms the Cutting Edge of This Paring Knife. Potato Eyes are Quickly Removed by Means of the V-Shaped End

This New Heel Attachment Is Simply a Wedge of Rubber That is Nailed to the Worn-Down Leather Heel

Genuine Shells, Meant for the Use of the American Army in France, Form the Pedestals of Parlor Lamps Now Made by an American Company. The Shade Is of Painted Parchment

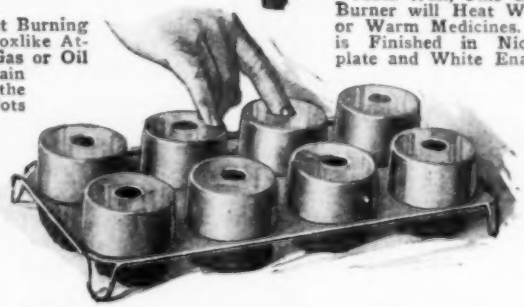
This Bottle Cap, Used to Close Wood-Alcohol Bottles and Similar Containers, is Provided with an Ingenious Lock and Key

Slipped around a Thimble, This Thin Band of Steel Serves to Cut Thread with Its Hooked, Sharpened End



With Only One Jet Burning beneath It, This Boxlike Attachment for the Gas or Oil Stove will So Retain and Distribute the Heat That Three Pots can be Boiled Simultaneously

Screwed to the Bedroom Wall, This Gas Burner will Heat Water or Warm Medicines. It is Finished in Nickelplate and White Enamel

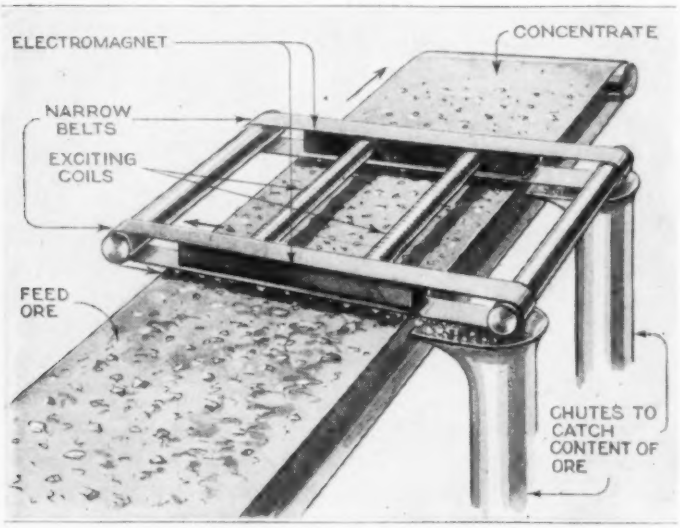


When the Muffins Are Brown, the Pan is Inverted on the Table. As the Finger is Pressed against the Disk in the Bottom of Each Tin, the Muffin Falls to the Table

WET MAGNETIC CONCENTRATION IMPORTANT

By F. H. MASON

MAGNETIC concentration of minerals, particularly of iron ores, has long been practiced, but until recently it always has been done on dry ore. To the metallurgical staff of a Canadian mining company belongs the credit, it is believed, of being the first to adopt wet magnetic concentration in the dressing of ores.



Diagrammatic View of the Concentrator: The Magnetic Particles are Attracted to the Narrow Belts, and Passed to the Chutes, While the Non-magnetic Portions Go to Separator Tables at the End of the Wide Belts

The method was evolved after a great deal of experimentation, extending over a period of more than 10 years, in an effort to find a satisfactory process for the treatment of the ores from one of the company's mines. These ores are dense sulphides, and consist of an intimate mixture of zincblende, marmatite, galena, pyrrhotite, and pyrite, with from three to six per cent of gangue. The pyrrhotite, which is the principal iron mineral, is only feebly magnetic as it occurs in the ore, but it has been demonstrated that its magnetic properties may be greatly improved by a preliminary heat treatment. The ore, therefore, after it has been crushed to pass a 2-in. gauge, is passed over an electric screen, where the fine material is separated from the coarse. The latter is passed through a revolving furnace, where it is heated to a temperature of about 1,000° F., while the fine ore is carried by a belt conveyor and is mixed with the coarse as it leaves the furnace. By this device, the fine is heated to the required temperature, but not overheated, as it would be if put through the furnace. The mixture of fine and coarse ore is then cooled rapidly in a revolving steel drum, the bottom of which is immersed in running water. This method of cooling seems to play as important a part as the heating in improving the magnetic properties of the pyrrhotite, for it has been demonstrated that, if the ore is allowed to cool naturally, there is little improvement, while if it is dropped directly into water, those properties are almost entirely lost.

The heat treatment makes the ore friable, so that it is easily pulverized in a ball mill. The pulverized pulp is passed over the concentrator wet, as it comes from the ball mill. In the earlier experiments dry magnetic concentration was attempted, but no notable success was achieved. The magnetic particles of the wet pulp, on the other hand, are separated readily by the magnet.

The magnetic concentrator, which was designed by the metallurgical staff in collaboration with the makers of the machine, consists of an endless belt running on rollers. The two terminals of a powerful electromagnet, excited by a 15-ampere current, cross the full width of the belt at right angles to its length, and divide the belt into three roughly equal parts. A narrow endless belt runs on rapidly revolving pulleys between each terminal of the electromagnet and the main belt, and extends well beyond both the main belt and the magnet.

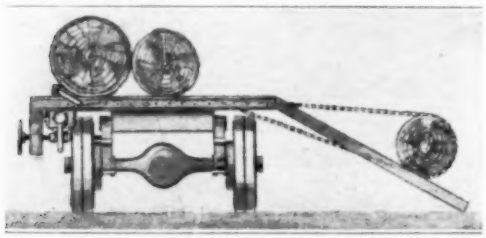
The wet ore is fed evenly on the main belt, and is carried by it in a thin layer underneath first one and then the other terminal of the electromagnet. The magnet attracts the magnetic particles of the pulp, and attaches them to the underside of the narrow belt which carries them toward a chute, into which they drop immediately they leave the magnetic field. Any ore particles that pass the first terminal of the electromagnet are picked up by the second, and the unmagnetic portion of the ore, consisting of zincblende, marmatite, galena, pyrite, and

gangue, passes into a chute at the end of the main belt and is carried to separator tables, where the zinc and the lead sulphides are partly dissociated. The magnetic particles, which still carry some galena and zincblende, owing to the intimate mixture of the original mineral, is reground and repassed over the machine.

The wet magnetic-concentrating plant referred to is at present treating 600 tons of ore per day, and, by means of the subsidiary treatment on the separator tables, is producing, besides iron, a satisfactory concentrate from which zinc is obtained by the electrolytic method.

WINDLASS ON SIDE OF TRUCK MAKES LOG LOADING EASY

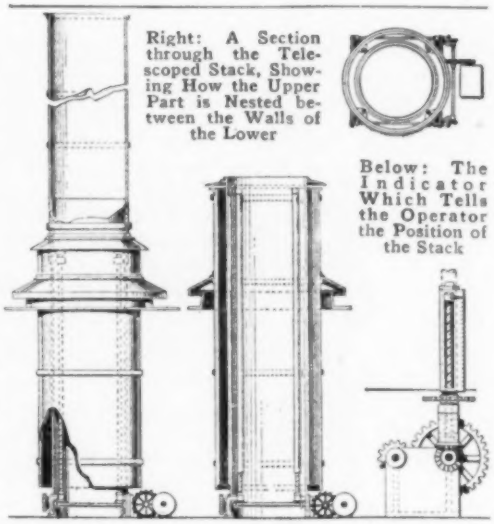
A small winch which attaches to the automobile truck and that makes log loading easy, has recently been invented. It is used with two or more timbers which are inclined from the ground to the side of the truck floor. The winch is fastened to the frame on the other side, just beneath the floor. Gears connect the winch to the engine transmission. To raise the log from the ground to its position on the truck, a chain is passed beneath it. One end of this chain is secured permanently to the truck frame, the other passes over the winch. As the winch clutch is thrown in, the chain is wound upon the drum, and the log rolls up the inclined timbers.



At the Left of the Frame is Seen the Winch Which, with the Chains and Inclined Timbers, Pulls Logs to the Truck Floor

NEW TELESCOPIC SMOKESTACK FOR USE ON LARGE SHIPS

With inland cities becoming seaports, and rivers made into mere arms of the sea, ocean-going ships must meet new problems. In this connection, an improved form of telescopic smokestack, invented primarily to reduce visibility in war time, may find use. The upper half of the new stack slides between the double walls of the lower half, raised and lowered by four vertical threaded rods operated by electric motor or by hand. The rods also are between the walls, and protected from both smoke and weather.



Right: A Section through the Telescoped Stack, Showing How the Upper Part is Nested between the Walls of the Lower

Below: The Indicator Which Tells the Operator the Position of the Stack

The Smokestack is Shown Both Extended and Telescoped, the Sectional Portions Revealing the Mechanism

They may have a travel as great as 20 ft. An indicator that tells the operator the position of the stack at all times is a feature of the invention.

DOLL OPENS LIPS AND CLOSES EYES AS IT ROCKS ON BASE

A doll whose unusual accomplishments the children will find most fascinating is soon to make its début in the toy market. Standing upright upon a heavy, curved base, it will be seen, the doll closes its eyes and opens its mouth every time it is inclined from the vertical. This action is effected by the pivoted, weighted arms, which are held vertical by gravity as the body is moved. The arms are carried on a transverse shaft to which a short crosspiece is fixed.

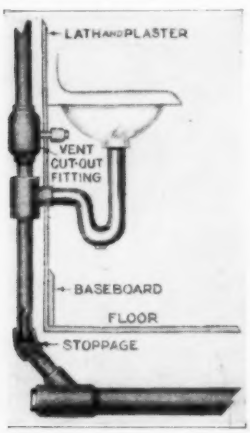
As arms and body are relatively displaced, one end and then the other of the crosspiece tilts a horizontal plate, and so moves the chin element, attached to the plate. The pivoted eyeballs are linked to the plate.

TUBE AROUND SHOULDERS IS NEWEST SHOWER BATH

A bathing apparatus now being introduced by an American manufacturer might be called a "vest-pocket shower bath" with but little departure from the literal truth. It is composed of a metal tube which fits snugly around the shoulders of the bather. When the tube is worn in this way, a shield of rubberized cloth, or similar material, encircles the neck, and deflects the water downward, over the body, as it is sprayed from perforations around the inner side of the tube. Water is supplied to the tube from the bathtub faucet by means of a rubber hose of suitable length.

VENTILATING-PIPE CUT-OUT IS NEW PLUMBING FITTING

The house owner can now avoid the occasional necessity for ripping out floors and walls in the search for plumbing stoppages by installing a new fitting, called a vent cut-out. This is a simple valve which replaces a short length of the vent, or ventilating pipe. When a stubborn stoppage develops, the nickelplated handle of the cut-out is operated to close the vent. This done, water or air pressure can be applied through the fixture, which in the illustration is a wash-basin, and the stoppage blown out. The cut-out is so devised that it is open at all times, except when actually held closed.



NEW PROCESS TAKES GASOLINE FROM HEAVY HYDROCARBONS

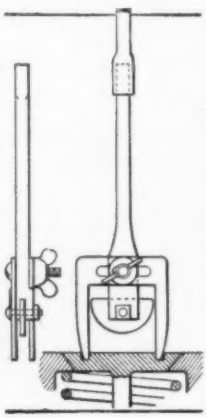
Not only the heavy liquid hydrocarbons, but bitumen, and the residues of distillation, are made to serve as bases for the extraction of gasoline by a newly patented European process. The material is heated in contact with hydrogen at some 300-lb. pressure, the temperature gradually rising from 140 to 750° F. This results in complete saturation with hydrogen, and the production of gasoline of good quality. In one test, using 22 lb. of heavy oil from Galicia, hydrogen was introduced at 1,500-lb. pressure, and in 12 hours of heating, 21⅓ lb. of gasoline was produced.

SIMPLE VALVE REGULATES WINDMILL TANK SUPPLY

Simplicity and reliability are features of a new ball valve designed to fit the supply pipe of a windmill water tank. The valve screws directly into the pipe fitting in the tank, and is normally kept open by gravity, the ball hanging below its cup. A stem on the ball slides in a hole through the perforated top, having an eye at its upper end. A copper wire equipped with a float, such as an empty jug may be attached to the eye, to close the valve at the desired water level.

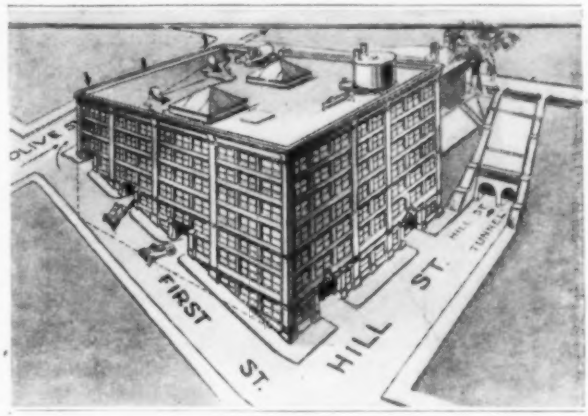
AUTO-VALVE GRINDING TOOL FITS ANY MAKE OR SIZE

Since the spanner sockets in gasoline-engine valves are not all alike, a California inventor makes a grinding tool adjustable to fit all of them. The movable spanner legs are held by a wing nut, and may be turned clear out of the way so that a metal blade located between them can be used instead. This fits the type of valve with a slot in place of holes.



BLOCK OF MANY GRADES SUGGESTS ODD GARAGE

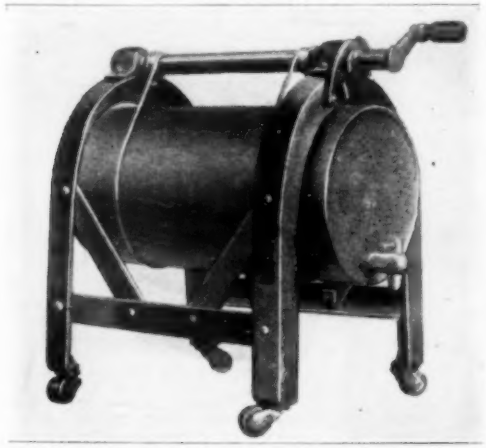
There are few locations in the world where a seven-story building could be provided with a street-level entrance to each floor. Los Angeles, however, has a city block which possesses that curious characteristic. On this unusual plot it is proposed to build a seven-floor concrete municipal garage, 300 by 260 ft., with a first-floor entrance at the front; second, third, and fourth-floor doors at the side, and fifth, sixth, and seventh-floor doors at what would normally be the rear. The basement and roof also would be accessible. With repair shops and gasoline supply on each floor, the garage would accommodate, it is estimated, 500 cars to a floor, including the basement, and 300 on the roof, or a total of 4,300. The plan was inspired by the city's rapidly growing difficulties with its auto-parking problem.



Garage with Street-Level Entrances to Every Floor and the Roof, Made Possible by a City Block of Unusual Grades: The Estimated Capacity Is 4,300 Cars

WINDLASS ON BARREL SUPPORT SERVES TO LIFT CASKS

A labor-saving feature of a recently invented movable barrel support is a windlass for lifting the unwieldy containers to a convenient height. Two metal arches, mounted on casters, and connected by braced side bars, form the frame of the contrivance. The windlass comprises a crank-equipped rod, which turns in bearings on top of the arches, and serves as a winding drum for two rope slings, designed to hold a cask.



Movable Barrel Support: The Crank-Operated Windlass on Top of the Arches is Employed for Lifting and Holding Casks

SIGNIFICANT FOSSIL REMAINS FOUND IN WEST INDIES

The question of the origin of the West Indies will be decided, scientists aver, when the indigenous animal life is found to be related indisputably to that of the South and Central American mainland. But mammals, which, being wingless, could not have flown over the intervening seas, are unfortunately the most poorly represented group of the higher life of the Antilles. For this reason much scientific interest attaches to a recent expedition to Jamaica, backed by the American Museum of Natural History. Believing that the West Indies once had a much larger mammal inhabitation than today, the expedition concerned itself with the excavation of fossil fauna from the island's limestone caves. Many fossils were found, several of them new to science. It was learned, in particular, that Jamaica was formerly the home of one or two gigantic rodents, larger than any living today. These were of a sluggish, heavy-bodied type whose nearest relative lived ages ago on the Santa Cruz formation of Patagonia, in southern South America. A few more discoveries of this sort will tend to establish as a fact the assumption that the West Indies are only the unsubmerged remnants of a once mighty continent, probably connected with South America, by way of Honduras, on the west.

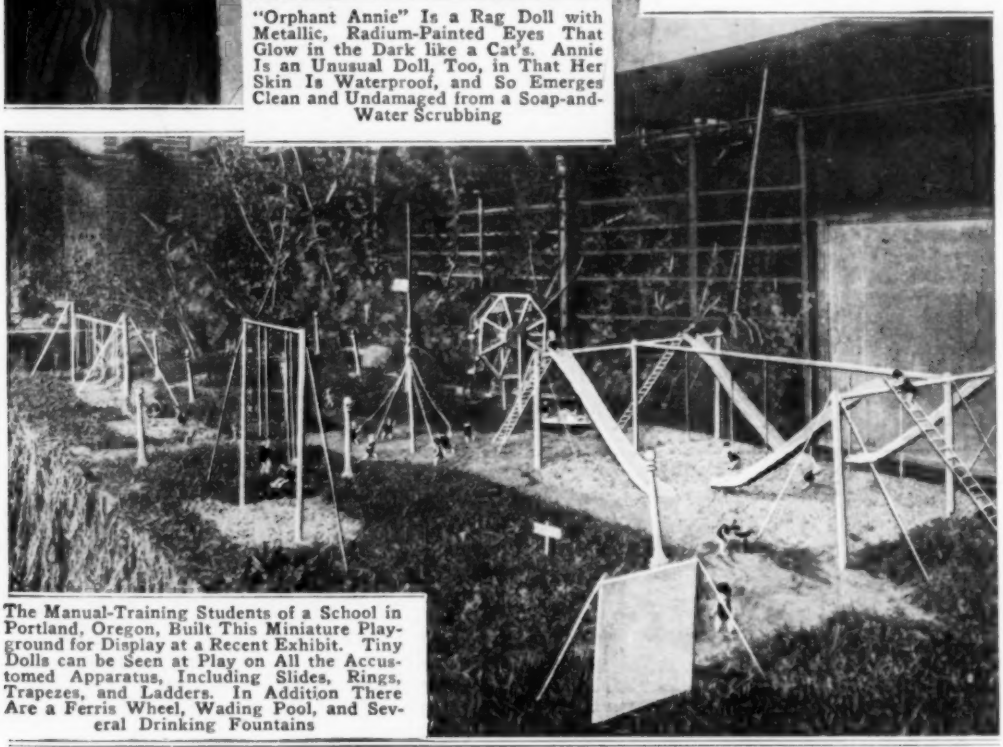
The Beautiful Moana Valley, About 18 Miles from the Hawaiian City of Honolulu, Was Recently the Scene of a Kite-Flying Contest That Drew Youthful Contestants and Spectators, Old and Young, from All Parts of the Island. The Asiatic Influence Was Discernible in the Design of All the Kites, Particularly of the "Centipede" in the Foreground

The Small Boy, Desiring a Sidewalk Speedster, Now may Choose from as Large a Variety as His Father in Choosing an Automobile. This Latest Type is Propelled by Hand Cranks and Steered with a Foot Bar

Democracy Is the Rule at an Infants' Home in Bedford, England. For the Afternoon Airing, the Babies are Loaded into Cart-like Perambulators Which Hold Six. A Nurse Is in Charge of Each Vehicle

A New Toy That Instructs as It Entertains Is the Drawing Board Shown Above, Both as a Table and as an Easel. The Child Reproduces the Picture at the Top of the Board by Means of the Pantograph, Then Colors His Drawing

"Orphant Annie" Is a Rag Doll with Metallic, Radium-Painted Eyes That Glow in the Dark like a Cat's. Annie Is an Unusual Doll, Too, in That Her Skin Is Waterproof, and So Emerges Clean and Undamaged from a Soap-and-Water Scrubbing



The Manual-Training Students of a School in Portland, Oregon, Built This Miniature Playground for Display at a Recent Exhibit. Tiny Dolls can be Seen at Play on All the Accustomed Apparatus, Including Slides, Rings, Trapezes, and Ladders. In Addition There Are a Ferris Wheel, Wading Pool, and Several Drinking Fountains

TINY INDIVIDUAL HOTBEDS PROTECT EARLY PLANTS

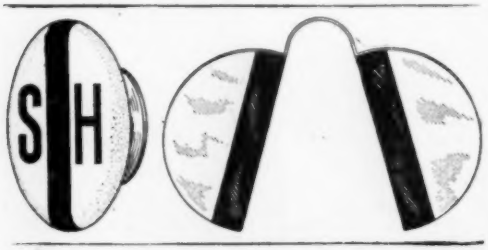
Little greenhouses just large enough for a plant or two, or for a single row of them, made of oiled paper with either

A Miniature Greenhouse Made of Oiled Paper, with Glass or Cheesecloth Windows, for Protecting a Single Plant or Row from Wind and Cold

glass or cheesecloth top, constitute a valuable contribution to gardening made by a Minnesota inventor. The tiny hotbeds, shipped flat, are set up, after folding, by pushing stakes through slots in their sides into the ground, notches being provided for propping them up with a stick when ventilation is needed. With this protection, crops may be planted three or four weeks earlier than usual, and less seed is needed, because of the protection from wind and cold, and the conservation of moisture.

DISTINCTIVE BUTTON WORN BY DEAF IN HOLLAND

For the protection and greater ease of deaf persons in Holland, a society devoted to their interests has introduced a distinctive button to be worn by those afflicted. A small white disk is bisected by a vertical red stripe, the white ground at the sides bearing the letters "S" and "H," initials of the words "bad hearing" in the Dutch language. Widespread advertising has given the mark universal recognition, and strangers who address a wearer of the button regulate their voices accordingly. Deaf bicycle riders are supplied with a similar attachment in two parts, connected by a yoke, which is hung over the front mudguard.



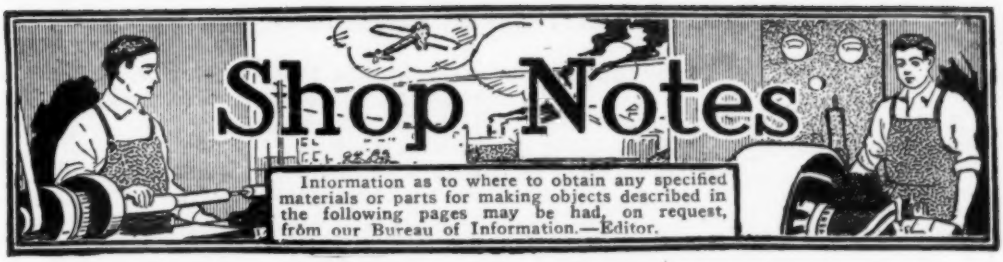
Left: The Button Worn by Deaf Persons in Holland. Right: The Marker Attached to Their Bicycles

HUGE AMMUNITION MAGAZINE TO BE BUILT IN IOWA

On the site of the old artillery-proving grounds at Bellevue, Ia., according to report, the government is soon to construct a monster magazine for the storage of ammunition reserves. Scores of railroad sidings and numerous connections to near-by railroad systems will be built in order that supplies from the magazine may be rushed on short notice to either coast. But most of the government appropriation will be spent on the 81 new buildings required. Of these, 74 will be built of asbestos and concrete, and will shelter the shells and high explosives.

GAUGE MEASURES CYLINDER BORES DIRECTLY

A new and simple gauge for the measurement of cylinder bores is now gaining the approval of garage mechanics as a substitute for the internal micrometer. It consists of nine steel blades, or strips, each of determined and indicated length, and each differing from the next by a few thousandths of an inch. That the set may not be broken, all the blades are fixed to a single pivot. To use the gauge, the mechanic selects the blade he believes to be nearest the size of the cylinder bore, turns it at approximately right angles to the rest, and thrusts it into the cylinder. If the blade is too long or too short, others are tried until a fit is found. As the ends are not squared, but are arcs of the same circle, the blade may be used at a little more or less than right angles with the longitudinal axis of the cylinder, with no loss of accuracy.


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

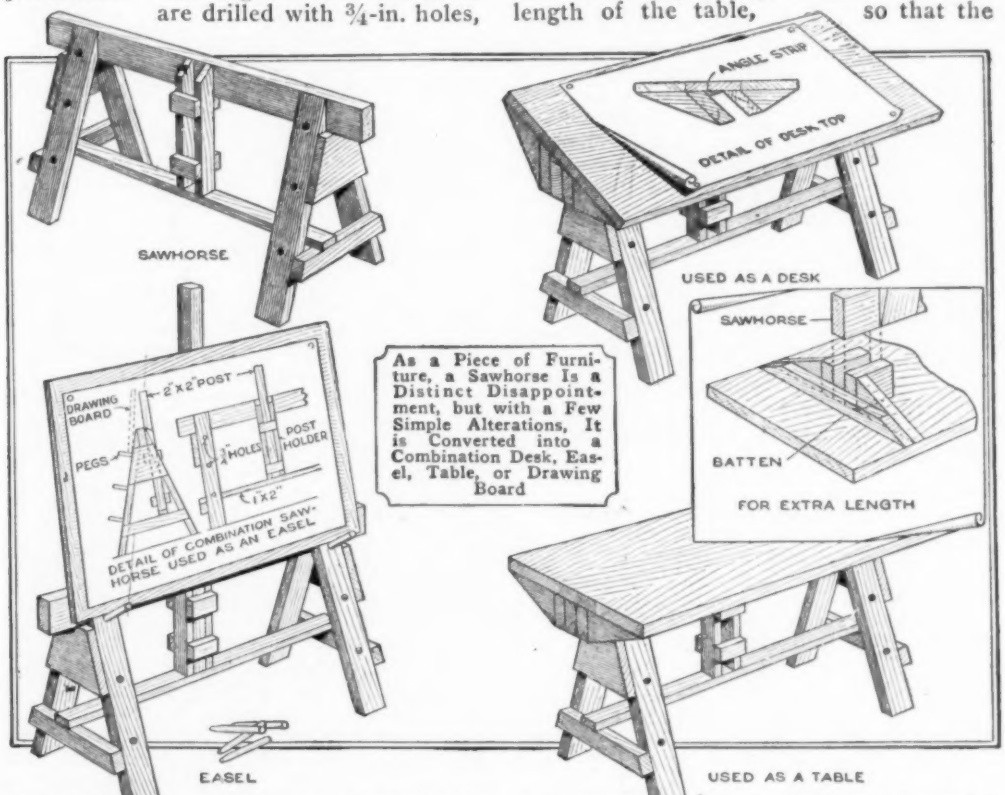
Combination Sawhorse, Desk, Table, and Easel

BY ARTHUR J. KELLY

A SAWHORSE can be used for little else but supporting work, and it requires considerable imagination to use it for anything other than its commonplace duties. However, a few simple changes, easily made by anyone, will convert it into a combination of sawhorse, desk, table, and easel.

After the horse has been made, a strip is nailed to the bottom crosspieces, as shown. This strip supports the easel-post holder, which is made to accommodate a 2 by 2-in. upright of any length desired, although 6 to 8 ft. will meet most requirements. The legs of the sawhorse are drilled with ¾-in. holes, for wood en pegs to support the easel. By providing all four legs with holes and pins, two signs or drawings can be placed on the easel at once.

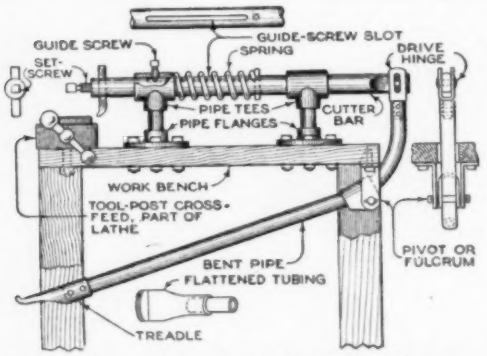
The boards for the table top are cut the same length as the horse. The holder is made as shown, to fit on the projecting ends of the horse. When a table is to be made longer than the horse, the holding arrangement should be made as shown in the insert drawing. To make the desk, or drawing board, the same arrangement is followed, with the exception of the blocks which hold the table to the sawhorse; these will vary in slant, to accord with individual requirements. The small angle strip is nailed the full length of the table, so that the center will not sag for lack of support, and to aid in alining the battens.



As a Piece of Furniture, a Sawhorse Is a Distinct Disappointment, but with a Few Simple Alterations, It is Converted into a Combination Desk, Easel, Table, or Drawing Board

A Homemade Foot-Power Shaper

A shaper, which, when mounted on a heavy bench, is capable of handling a great deal of surfacing for the experimenter, is shown in the accompanying illustration.



A Foot-Power Shaper of Considerable Rigidity may be Constructed of Materials Which Are Usually Available in the Small Shop

The cutter bar or ram is a heavy bar of cold-rolled steel; it is slotted near one end to receive the tool, and a hole is drilled and tapped for the clamping set-screw, as shown. The guides are made of pipe tees, sufficiently large in diameter to hold a shell of babbitt to form bearings for the ram. The front tee is drilled and tapped to hold a screw, which, running in a groove machined in the ram, serves to guide it. A spring is placed back of the front tee, and this, bearing against a pin driven through the ram, provides for the return stroke. The foot lever is of bent pipe, in the upper end of which is riveted a U-shaped yoke, which works on a pin in the end of the ram. A flat plate, with a lip on the edge, is riveted to the other end of the bar to serve as a pedal. The vise, if a suitable machine vise is not handy, may be made of angle iron and a long screw.

Keeping Rats from Stored Apples

The fondness of rats for apples seems incongruous, considering their better-known appetite for grain, yet it exists, and in the case of stored fruit, is often costly to the orchardist. A practical means of protecting apples, applicable to vegetables as well, has been tried and recommended by a commercial apple grower. This man had a storage cellar in which the rats were playing havoc. Several methods of prevention had been tried unsuccessfully. He at last tried dusting the apples lightly with sulphur. The results were instant and spectacular. The rats made no more fresh cuts, and even let alone apples already bitten. When it became time to ship the apples, it was only necessary to wipe off the sulphur dust. The apples are not injured in the least by this treatment. Having an opportunity to select, rats will invariably attack sweet apples before others, but the sulphur method is as practical with these as with others.—John T. Bartlett, Boulder, Colo.

Laying Out a Regular Hexagon with a Carpenter's Square

A carpenter's square can be used for laying out a hexagon if either the long diameter, the short diameter, or the length of one side be known, by one of the following methods:

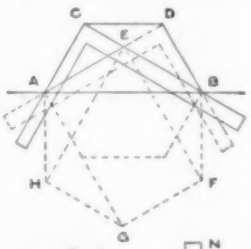


Fig. 1

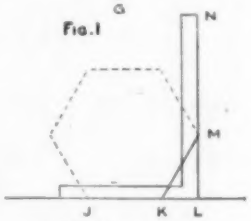


Fig. 2

First: Long diameter known. Lay out a line equal in length to the diameter, as AB, Fig. 1. Place the square in the position shown, with AC equal to one-half of AB. The point C is at one angle of the hexagon. The other three unknown angles are then located in the same manner, and the points connected to form the complete hexagon, as indicated by the dotted lines.

Second: Short diameter known. Let the line AB, Fig. 1, now be the short diameter. Place the square in the same position as in the first case, and draw the line BC; then reverse the position of the square, as shown by the dotted lines, and draw the line AD. The intersection of the lines BC and AD at E is one point of the hexagon. Then, by placing the square on the line AE and making EF and AG equal to AB, the points F and G are located. The angle H is located, in a similar manner, from the line BE.

Third: Length of side given. Lay off line AB equal to twice the length of a side, and proceed as in the first case. Or, lay off line JK, Fig. 2, equal to the length of a side. Place the square on the line as shown, with KL equal to one-half JK, and draw line LMN. Make

the line KM equal to JK; the point M will then be at one point of the hexagon. Other unknown angles may be located in a similar manner.—R. C. Hardman, Balboa Heights, C. Z.

Iron Pipe as Gear Puller

One way to get a gear off a shaft is to find a piece of pipe a little larger than the shaft, file off the end to a very nearly true surface, and clamp it to the bench. Then slam in the shaft and let the gear strike the end of the pipe. If the gear is hard, it will not be damaged by the blow against the pipe, and if the pipe is faced off pretty accurately there will be little, if any, tendency to damage the shaft.

Truing Up Gas-Engine Valves

Owing to the hardness of the metal now in general use for the valve heads of internal-combustion engines, about the most satisfactory method of truing them up is by grinding on a universal or other grinding machine.

On removing the valves from the engine, the valve stem should first be trued up, if found necessary. These valves generally have a center hole in the head end only, since a center hole in the stem end would cause the stem to wear down rapidly under the continued striking of the valve tappet. It is, therefore, rather difficult to hold the valve between centers. As it is desirable to have such work suspended between centers, a false center was made, which enabled better and faster work.

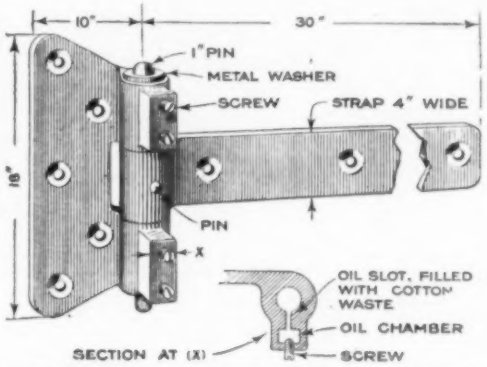
This false center is made, necessarily with considerable care, from cold-rolled steel, and consists of a sleeve to fit over the valve stem. This sleeve is threaded with standard pipe thread, and is then slotted to permit sufficient compression to hold the valve tightly when the nut is turned up on the tapering thread. A center hole is drilled into the solid end of

The Lack of a Center Hole in the Valve Stem is Overcome by the Use of a False Center

the sleeve, and the work is then taken to the grinding machine and the face ground, the valve revolving between centers during the operation.—M. L. Lowrey, Livermore, Calif.

Hinge for Heavy Doors and Gates

The drawing shows an extra-heavy hinge that was designed for use on all railroad and teaming gates, and heavy



A Rusted Hinge on a Heavy and Expensive Gate Is Dangerous and Costly. This Specially Designed Hinge, for Heavy Gates, Is Proof against Sticking

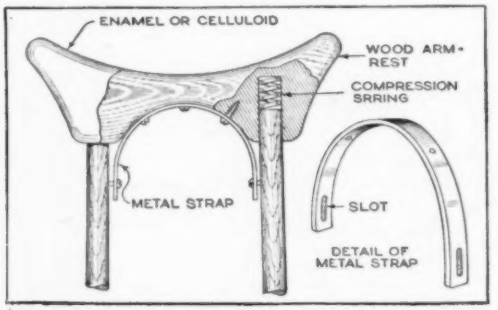
doors of a large industrial establishment. The principal parts of the hinge are steel castings, provision being made for oil chambers in the butt, to keep the pin lubricated and prevent rusting; the pin fits loosely in the butt hub, but must be driven through the strap to which it is rigidly attached with a pin, as indicated. Dirt and water are prevented from entering the hinge bearing by a tight-fitting copper washer forced on over the projecting upper end of the hinge pin. The oil chamber is provided with two screws, for filling with lubricant, so that the hinges may be used for right and left-hand doors, the upper screw being removed for filling. The oil slot is packed with waste before the hinge pin is inserted, and after the installation has been made, the oil chamber is filled with heavy lubricating oil; this keeps the waste saturated with lubricant and prevents the pin from rusting and sticking.—M. E. Duggan, Kenosha, Wis.

An Emergency Lap

In replacing a set of worn wristpins in a new set of automobile pistons, it was found that the new pins were a trifle oversize and would not enter the hole. No reamer of the right size was at hand, so one of the worn pins was placed in the chuck of an electric drill, and coated with valve-grinding compound. By holding the pistons on the pin and turning on the power for the drill, the holes were soon ground out to the desired size; this method was found to produce a perfect-fitting job.

A Comfortable Crutch

The crutch shown in the drawing is the invention of a man who is compelled to



An Improved Crutch That does Not Heat or Chafe, and Provides Comfort to the Crutch User through a New Form of Spring Suspension for the Armpiece

use crutches continually; he has obtained a patent on the manufacture of this crutch, but appreciating the discomforts of the usual crutch he has given permission to other crutch users to make a pair for their personal use.

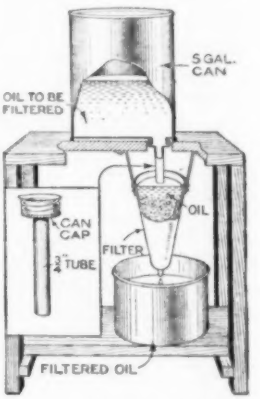
This crutch has a specially designed armpiece which is devoid of angles, the entire surface being rounded and finished in special enamel, or celluloid, to prevent friction, wear of clothing, and chafing. In the underside of the armpiece, holes are bored to contain the compression springs shown in the drawing; these springs are suited to the weight of the user. The openings also serve to receive the ends of the crutch staffs which rest against the springs, the combination acting as a cushion, or shock absorber. A metal strap, which is attached underneath the armpiece, is held to the staffs in the manner shown in the drawing, and retains the parts in movable relation. The armpiece, being entirely independent of the crutch staffs, adjusts itself to the various movements of the body, and the curved surface does not change its form through pressure, which would be the case if it were padded or upholstered. The proper distance from the arm to handpiece and the correct length of the crutch are readily obtained by sawing off pieces from the ferrule and upper ends of the staffs to the required length.

Ammonia as a Fire Extinguisher

Ammonia pistols are effective against either man or animal, and as weapons of defense are carried by many motorists. They are also quite effective, under certain conditions, for extinguishing small gasoline fires. The ammonia fumes being heavier than air will quickly extinguish the flame, especially if it is confined. A quart bottle of ammonia, carried on the car, makes an effective fire extinguisher to carry on tours, and besides, it is good for cleaning glass or polished metals. Also, an "automatic" fire extinguisher, for the garage, may be made by suspending bottles of ammonia from the ceiling with inflammable strings, which are burned by the flames allowing the bottles to drop and break. The ammonia fumes in the confined garage would be of assistance in checking, if not entirely extinguishing, the blaze.—G. A. Luers, Washington, D. C.

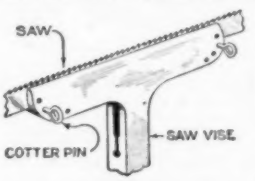
Constant Level for Filtering

In filtering liquids, such as oils that are to be recovered, or other liquids that run through the filter very slowly, the arrangement shown in the drawing will keep a constant level of the liquid in the filter. A short piece of pipe is soldered over an opening made in the screw cap of a 5-gal. can. The oil, or liquid, to be filtered is placed in the can; the cap is screwed on, and the can inverted over the filter, as shown in the drawing. When the level of the liquid in the filter reaches the end of the pipe, the flow from the can stops until the level falls below it, when more of the liquid is released. This arrangement, in the case of oils, which filter slowly, is automatic and allows the filter to be changed.



Adapting Saw Vise to Sharpening of Band Saw

When attempting to sharpen a band saw in the common saw vise, it is difficult to prevent the saw from slipping down too far in the vise while shifting it along.



By drilling a row of holes at each end of the vise, as shown, and putting two cotter pins in the proper holes, this trouble is avoided, and

there is no danger of destroying the set of the teeth, or injuring the newly sharpened ones.—C. M. Graham, Waterloo, Ia.

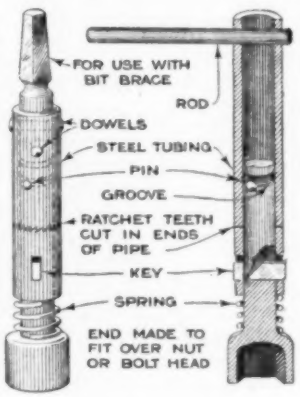
Blueprinting Part of a Tracing

Very frequently a print of only a portion of a tracing is desired, without white spots showing where the unnecessary parts have been blocked out by covering with paper.

A paper negative, having white lines on a brown or black background, is made from the tracing. Unnecessary lines are blocked out on this negative by using a red crayon, or ink. From this negative, a black-line positive is made, which produces black lines against a white background. From the black-line positive, blueprints are made in the usual manner. This method can be profitably employed when it is desired to make separate details of a drawing, without reproducing the whole job.

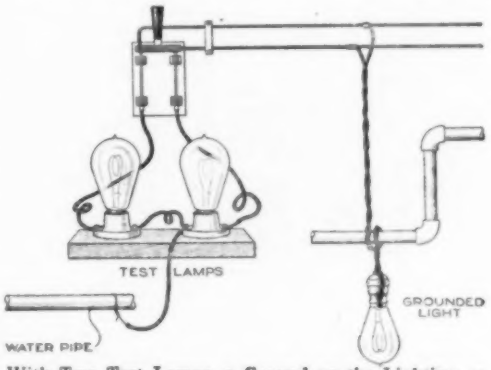
Ratchet Wrench for Tight Places

The ratchet wrench shown in the drawing is particularly adapted for drawing up nuts and bolts in tight corners and, as indicated, it can be made for use in a bit brace, or with the familiar rod handle. The ratchet consists of two sections of steel tubing with sawlike teeth cut on one end of each piece, so that the teeth on both parts engage. The wrench socket is formed from a bar of cold-rolled steel with a groove at its upper end to accommodate a pin, which holds it to the upper tube without interfering with the rotation of either. In assembling the wrench, a stiff compression spring is slipped over the shank of the wrench, which is then inserted into the tube, where it is secured with the key and pin shown; by providing an assortment of wrenches of different capacities, but with the same size shank, it is possible to make the same holder take any of them by removing the pin and key, and inserting another wrench.



Ground Detector for Light and Power Circuits

When the ground lamps at the switchboard of a building show a leakage on the line, some clue as to its location can often be found by quickly opening the switches which lead to the various departments or floors. But when a trip is made to the department indicated, with no detector handy, one may search a long time for the ground.



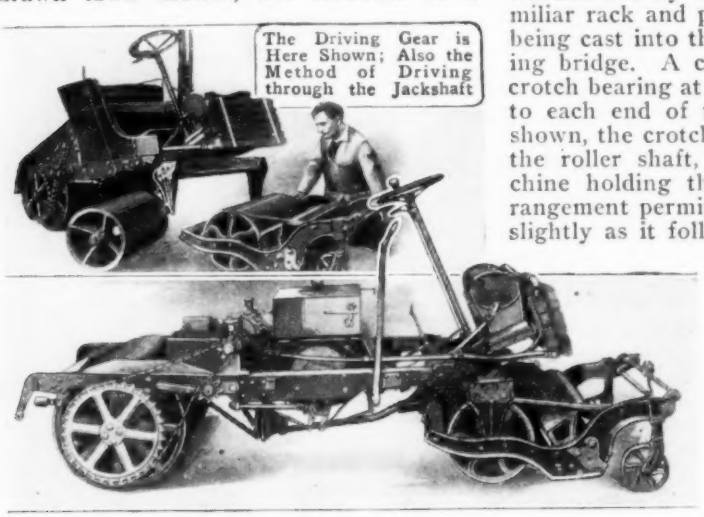
With Two Test Lamps, a Ground on the Lighting or Power Circuit will be Readily Located

The illustration shows a simple ground detector used in a large mill for years. It is small, cheaply made, and accurate. Connect two 25-watt lamps in series with the two outer terminals of a circuit switch, at the dynamo or "live" side, with flexible cord long enough to clip over the blades. From any point between the two lamps, extend a flexible lead to the nearest ground, water or steam pipe. With a switch in the panel closed, light all the lamps in the room, and see if a ground is indicated by a dimming of one of the test lamps. If so, open the switch and see if the ground is removed. If still present, shift the connections to another switch, trying all in succession till one is found that will clear off the ground. This will then prove the grounded conductor to be on that circuit. Now look along the line of lights in this room till a flexible cord or socket is found in contact with a water pipe or machine frame. Leave the test lamps connected to the panel switch, and when the ground is removed, both lamps will glow dimly alike. In every test see that the ground detector is connected to the dynamo side of a switch, and not to the lighting side.—H. S. Rich, Cromwell, Conn.

¶Oxalic acid (poison) dissolved in water is excellent for cleaning tarnished brass.

A Motor Lawn Mower and Roller

By a clever combination of an early "one lunger" automobile and a horse-drawn lawn mower, the students of a trade school evolved the gasoline lawn mower and roller shown in the photograph. As an automobile, the machine had long been abandoned, and a few dollars kept it from the junk man. The motor and other parts of the machine were in good condition. The running gear, tires, fenders, and other parts were removed and discarded, with the exception of the rear axle, which was mounted over the engine cylinder and serves as a jackshaft to transmit power to the rear rollers; these driving rollers were attached to the frame with specially made cast-iron brackets, and each roller is driven independently of the other by a chain. The jackshaft, with the original differential, eliminates the tendency to slip when turning corners and making short turns.



The Driving Gear is Here Shown; Also the Method of Driving through the Jackshaft

Idler sprockets were attached to the frame, as shown, to allow the chain to clear other parts of the mechanism.

The steering gear was successfully worked out by an application of the familiar rack and pinion principle, the rack being cast into the specially made mounting bridge. A cast-iron bracket, with a crotch bearing at its lower end, was bolted to each end of the mounting bridge, as shown, the crotch fitting over the ends of the roller shaft, the weight of the machine holding them in place. This arrangement permits the mower to oscillate slightly as it follows the irregularities of the surface. A heavy set of rollers was also provided for rolling the lawn in early spring, before the mowing season opens. The change from mower to roller, or reverse, is made by simply elevating the front end of the machine to clear the crotches in the mounting-bridge brackets and rolling the one part out and the other in place, and lowering the machine again, with the crotches over the shaft ends. The original horse-drawn lawn mower was not altered in any way, with the exception of removing the shafts and driver's seat.—E. H. Krieder, Lancaster, Pa.

The Lawn Mower at Work, Showing the Seat and Cover, and the Convenient Control

Babbitt Packing for Steam Joints

Everyone who works in steam engineering, whether marine or stationary, finds that he could at times use a good metallic packing to advantage. Most metallic packings on the market are manufactured for a certain size of piston rod, or valve stem, and are not available for use elsewhere. They consist usually of brass and babbitt rings, so made as to fit into each other, and form a steam-tight joint. High-pressure steam packing, of woven linen, asbestos, etc., while easily procured for any size stuffing box, is not as lasting as metallic packing, nor does it always prove as satisfactory. The packing described below has the lasting qualities of the metallic packings, and at the same time is as easily applied as the high-pressure packing. It can be used on any size rod, or in any stuffing box, from a high-pressure piston rod to a low-pressure radiator-valve stem, and it can be made by anyone having the use of a lathe.

Melted babbitt metal is poured into a cylindrical mold, of any diameter or

length, depending upon the size of the lathe to be used. When cool, the babbitt cylinder is placed in the lathe, and light chips taken from it, until the stock becomes too small to work longer. These chips or ribbons should be about ⅛ in. deep, and not more than .005 in. thick; they are gathered in a box as they come from the lathe, and need no further attention until required for service. Usually 3,000 or 4,000 ft. of babbitt ribbon should be kept on hand, and the packing made up as required.

When ready to use these ribbons, stretch them over two nails, placed about 3 or 4 ft. apart, running the ribbon back and forth about the nails until, when grasped in the hand and squeezed tightly, the bunch has a diameter twice that of the required packing. The ends of any two ribbons are joined by twisting together, and short as well as long pieces can be used. The mass of ribbon is then removed from the nails, and the two ends are twisted in opposite directions, until the diameter is reduced to packing size. Before twisting, paint the ribbons with a mixture of cylinder oil and graphite, for lubricating.

The rope of twisted babbitt ribbons is then cut off in desired lengths, and applied just like any high-pressure packing, care being taken to allow for the expansion of metal at the joint, when the stuffing-box gland is taken up. A liberal amount of oil is applied to the piston rod or valve stem the first few days, until the babbitt works into place.

If care is taken when placing this packing, it will last indefinitely; the rod or stem will soon take on a high polish, and all leaking will stop; the packing needs taking up very seldom, and a new turn of packing can be put in at any time. The writer found it particularly good for high-pressure feed pumps, and has used it on such a pump with no attention, other than an occasional tightening of a gland, for 19 months.—L. E. Fetter, Portsmouth, N. H.

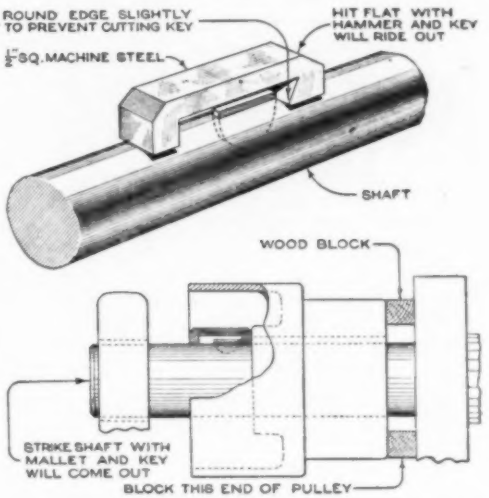
Tire Boot Made from Old Paper

A motorist, unfortunate enough to find himself in the country with a blowout and no patch on hand, was able to complete his trip by using pages from an old magazine. Seventy-five or 80 of the pages were torn out and placed inside, over the hole in the casing. When the tube was put in and inflated, the patch was held firmly in place, and the repair shop was reached without trouble.

Tool for Removing Woodruff Keys

A tool which will remove a Woodruff key from a shaft into which it is tightly fitted is shown in the drawing.

The tool is made from ½-in. square machine steel, bent and formed as shown;

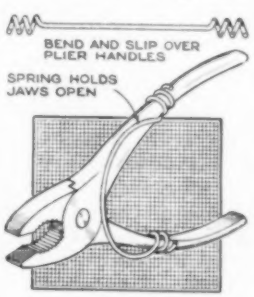

ROUND EDGE SLIGHTLY TO PREVENT CUTTING KEY
HIT FLAT WITH HAMMER AND KEY WILL RIDE OUT
½ SQ. MACHINE STEEL
SHAFT
WOOD BLOCK
STRIKE SHAFT WITH MALLET AND KEY WILL COME OUT
BLOCK THIS END OF PULLEY

A Simple Tool That Makes the Task of Removing Woodruff Keys Easy

on an exposed key it is used as shown in the upper half of the sketch. The lower sketch shows the tool in use where the hammer cannot be used directly. Small blocks of wood, of the proper thickness, are placed behind the pulley, which is slipped back until the blocks come against a shoulder on the machine, leaving just enough space between the pulley and key to insert the tool. A few blows on the end of the shaft will then remove the key. —F. K. Ladd, Bellows Falls, Vt.

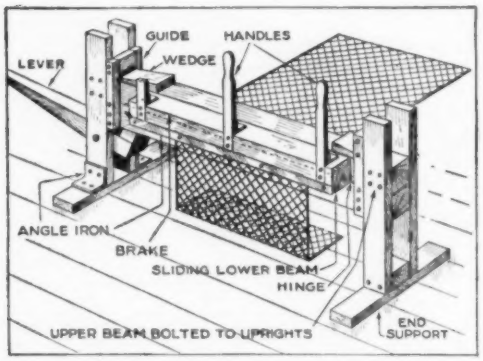
Spring Holds Pliers Open

A simple little fixture that expedites work with the pliers consists of a wire spring attached to the handles for holding the jaws apart, as shown in the drawing. The spring is made from a piece of spring wire and the coils are formed around the handles of the plier it is to be used with. Such an attachment permits of easy manipulation and simplifies working in close quarters.



Machine Bends Wire Mesh for Concrete-Column Reinforcement

Contractors and workers in reinforced concrete are aware of the difficulty involved in bending wire-mesh reinforcing for square columns. The machine shown in the drawing provides a convenient and



A Convenient and Economical Method of Bending Wire Mesh, for Reinforcing Square Columns, is Afforded by the Use of This Bending Machine

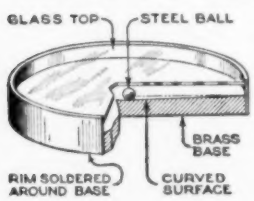
economical method of bending wire mesh into square or rectangular forms of any size. As shown, two wooden beams, about 6 in. square and of any convenient length, are supported between substantial uprights at the ends, the upper beam being permanently attached to the end supports with bolts. The lower beam slides up and down on guides, which are bolted to it at each end in the manner shown; the height of this vertical movement is regulated by wedges inserted between the crosspieces at the top of the guides and the upper beam. A heavy lever is mounted between the left end support, with a long bolt, in such a manner that the end of the lever will bear against the lower beam and press it against the upper beam when the lever is pressed down. The brake consists of a smaller wood beam which is attached to the upper beam with hinges so that the lower edges of both are flush; handles are fitted to the brake, and the lower edge is faced with a strip of angle iron, to prevent wear.

In use, the wedges are inserted under the guides in such a manner that just enough space is left for the strip or reinforcing mesh to be inserted between the upper and lower beams, and when the lever is pulled down, the reinforcing material will be tightly gripped between the two beams. The wire mesh is pushed through the opening between the upper and lower beams from the back of the machine; when the proper length has been pushed through, the lever at the end is pressed down, gripping the reinforcing mesh between the beams; the brake is then pulled downward, and the material is bent at right angles to the strip.

This operation is repeated as desired, and the finished reinforcing form is cut from the strip with a bolt cutter.

Steel-Ball Circular Level

A level for horizontal work, which is so simple that it does not have to be "made," consists of a piece of smooth plate glass, with a good steel ball placed on it. The rolling of the ball will indicate the low side instantly. A better level can be made by accurately finishing a piece of sheet brass on a surface plate, soldering a brass rim around it, and putting on a glass cover. If a lathe is available, a still better job can be made by making a disk that is very slightly concave, so that the ball will tend to remain at the center if the surface tested is level, but will roll out otherwise. The depression must be exceedingly slight, and should be of a spherical curvature, as nearly as possible. The best way to produce it is first to get the plate true, and then work down the center a little in the lathe, with fine emery cloth, taking care to make the deepest depression at the center, and taper off gradually to the edges, where the surface is left untouched.—Howard Greene, New York, New York.



Testing Automobile Generators

It is often desirable to test automobile generators when removed from the car. In such cases, it is usually difficult to drive the generator from a motor or other source of power, on account of the gear, or sprocket, with which the generator is usually equipped, without removing the gear and substituting a pulley. However, the gear can be converted into a temporary pulley without difficulty.

Take ordinary friction tape and make small rolls of it, just large enough to go

between two teeth; this is repeated until the spaces between all the teeth have been filled. Then wind the tape over the teeth in the direction the wheel is to be driven. Carry the tape around five or six times and then cover with a single layer of stiff paper, lapping the end and gluing it in the direction of rotation. Of course, with such a pulley, a narrow belt will be required.—B. B. Brackett, Brookings, South Dakota.

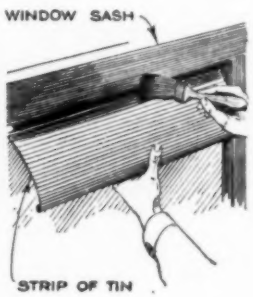
A Combined Scale and Protractor for Topographical Draftsmen

The combined scale and protractor shown in the drawing is made from a piece of transparent celluloid, and will be found especially useful for plotting the topography for highway and railroad locations, as it does away with the use of two instruments. This instrument, it will be noted, is a simple protractor with a quadrant cut out, as shown, the scale graduations being marked off along the edges from which the quadrant has been removed.

The drawing shows the plotting of a structure located at an angle of 55° to the left and 100 ft. distant from station 3+30. Place the center of the protractor at station 3+00, with the zero edge along the center line, and locate station 3+30 with a pencil. Holding the pencil at this point, slide the protractor along the center line until the pencil strikes the center, and turn the angle, then go out along the scale 100 ft. and locate the point of the structure; the protractor may then be used for drawing in the building.

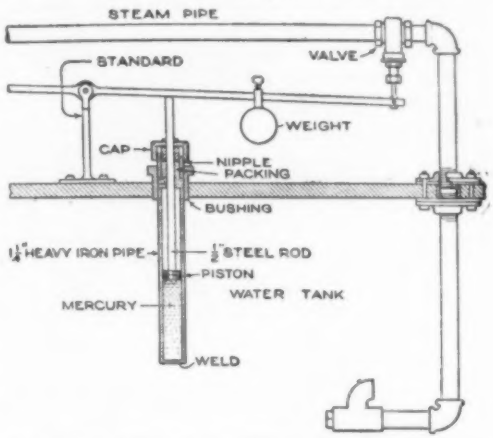
Aid for Painting Window Sash

To prevent paint from getting on the window glass when painting the sash, a useful tool for the amateur painter is made from a strip of tin, about 1 ft. long and 4 in. wide. This strip is slightly curved, and is held against the glass underneath the sash, in the manner shown in the drawing.



Regulator for Steam Water Heater Operates by Mercury Expansion

A low-cost temperature regulator, for steam water-heating plants, which depends for its action upon the expansive force of heated mercury, can be easily installed on the average heater. As shown in the drawing, a piece of heavy iron pipe, about 18 in. long, is inserted inside the heater. An iron piston is made, as indicated, to fit inside this pipe, the latter being partly filled with mercury before the piston is fitted in place and the bushing and packing that guide the piston rod and prevent the mercury from overflowing are added. The outer end of the piston rod bears against an arm, that is attached at one end to a standard, bolted to the furnace, and at the other to a gate valve in the steam line; the position of a suitable weight on this arm determines the point at which the valve opens and closes. The operation of this regulating device requires no attention, aside from adjusting the weight on the regulator arm. As the mercury in the pipe becomes heated, it expands and forces the piston up, closing off the steam supply, and in cooling, it contracts and allows the piston to drop and open the valve.



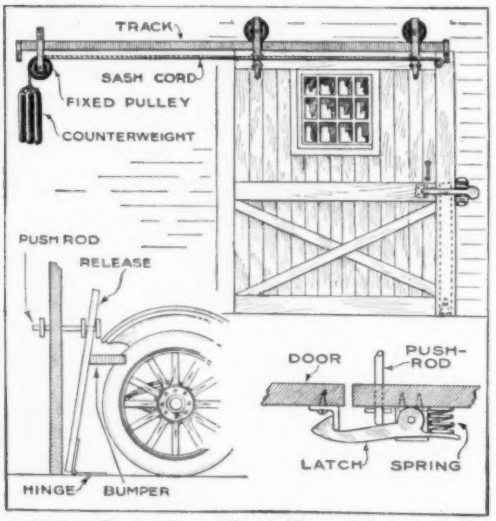
An Easily Attached Regulator, Made from Simple Materials, Controls the Flow of Steam to the Water Heater

Substitute for Screen Door

In places where it is impossible to hang a screen door, its place can be taken by hanging a full curtain of mosquito netting over the door opening. A wide hem is provided at the bottom and small weights or a metal rod are sewed inside to keep the curtain taut.

Sliding Garage Door Opened by Car

The drawing shows a simple attachment for a sliding garage door that is opened automatically. A counterweight is attached to the door, the weight of which serves to draw it back when the catch is released. The catch itself is a simple arrangement requiring pressure from the outside to unlatch. A piece of plank is hinged, at the bottom of the door, in an upright position, its length being such that the wheel, frame, or bumper can push it forward. A rod through the door frame pushes back a simple spring-retained latch and disengages it from the catch on the edge of the door.



A Sliding Garage Door That is Opened Automatically by Pressure of the Car against a Simple Attachment Which Releases the Latch

A Test for Fountain-Pen Ink

If a fountain pen chokes and "balks," examine the ink used before blaming the pen. Put a drop of ink on a blotter. If it spreads evenly, and looks like Fig. 1 in the illustration, one may be sure that it is all right. But if it leaves a very dark center surrounded by a lighter area, like Fig. 2, it contains a sediment, and is not fit to use in a fountain pen. The sediment will not spread out through the blotter like the more finely divided matter; hence it will appear only in a small spot, as shown.

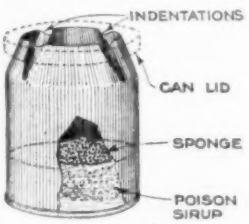
This Illustration Shows a Simple Test for Fountain-Pen Ink, Which Explains Why Pens Sometimes Refuse to Work

Regrinding Monkey Wrenches

After a monkey wrench has been used for heavy work for a long time, the jaws become worn to such an extent that they are not parallel and their gripping power is greatly reduced. A simple way to remedy this is to grind the gripping surfaces of the jaws until they are again parallel. Obviously, after this treatment, the jaws will not close tight unless the wrench is taken apart and the metal removed all the way around the shank of the wrench.—Everett W. Howe, S. Berlin, Mass.

Poison Sirup for Ants

A poison sirup recommended by the Department of Agriculture for combating the Argentine ant is made by dissolving 15 lb. of sugar in 7 pt. water, with ¼ oz. crystal tartaric acid, and boiling for 30 minutes. After the mixture has cooled, ¾ oz. of sodium arsenite (chemically pure), dissolved in 1 pt. of hot water, is added to the sirup and thoroughly stirred. Finally, 1½ lb. of honey is stirred into the sirup. In administering the poison, use an old can; make deep indentations on opposite sides, as shown in the drawing, and after filling with as much of the sirup as desired, insert a fairly large piece of sponge, and set the lid on top of the can. The openings made by the indentations in the can provide sufficient space for the entrance of the insects, and the surface of the floating sponge permits a large number of the pests to feed at one time. The cans are placed where they will be found by the ants who are attracted to the sweet mixture; in a very short time, the ants will have disappeared.—Allen P. Child, Kansas City, Mo.



¶A cheap mahogany stain is made by dissolving powdered dragon's blood in alcohol.

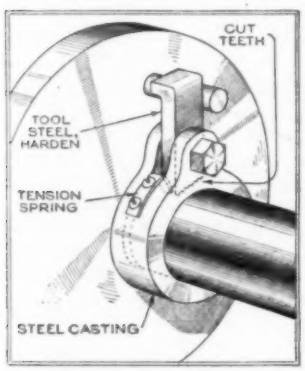
Keeping Vermin from Seeds Hung on Wire

Where seeds are stored by hanging them on a horizontal wire, it is often a problem to keep the rats and mice from getting to them, as these pests seem to be able to run along the wire as easily as anywhere else.

Procure several tin disks, such as ordinary sirup-can lids, about 4 or 5 in. in diameter; punch a hole in the center a little larger than the wire, and string two or three on each side of the seeds. The rats or mice cannot pass these, as, if they attempt to cross over them, the lids will revolve and throw them off.—S. Vanaken, Port Ewen, N. Y.

Automatic Quick-Acting Lathe Dog

When a large number of shafts of the same size are to be turned in a lathe, the output can be increased by the use of an automatic, quick-acting lathe dog, such as the one shown in the drawing. The body of the dog may be made from a steel casting, or worked up from the solid. The hole is made 1/16 in. larger than the shaft to be turned, and dogs of different size will be required to accommodate shafts of various sizes. The gripping dog is made of hardened tool steel, and provided with teeth at the lower end, which is made eccentric, so that the heavier the cut the greater will be the holding power.—R. F. Martlin, Dundas, Ont.

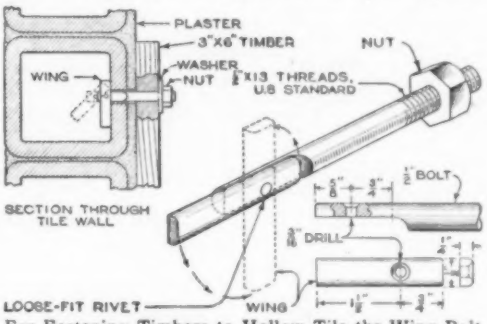


Detecting Pinholes in Camera Bellows

A convenient method of detecting pinholes in a camera bellows, or a changing bag, is to place an electric lamp inside, and examine the bellows, or bag, from the outside, in a dark room. The smallest gleam of light issuing from a pinhole can be easily detected by moving the light around inside. The back of the bellows should be covered, to prevent the escape of light which would interfere with the detection of the pinholes.

Wing Bolt is Used to Fasten Timbers to Hollow Tile

It is not possible to use expansion bolts or anchor bolts in hollow tile, as the pressure necessary to tighten the bolts will crack the tile, but, by using the type of bolt shown in the drawing, studding and timbers, may be fastened to the wall without damage to the tile.



For Fastening Timbers to Hollow Tile the Wing Bolt Illustrated Is Better than Expansion or Anchor Bolts

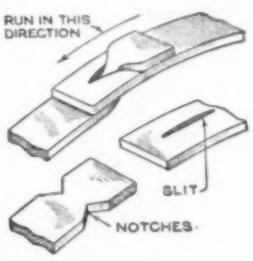
A hole is first drilled through the tile, about 1/8 in. larger than the diameter of the wing bolt used; the wing of the bolt is then set parallel with the body, and pushed through the hole, when the weight of the long end of the wing will cause it to fall, and span the hole, as shown.

Bolts of varying proportions should, of course, be used for different sizes of work, but the size shown in the drawing will be found suitable for general purposes.

The rivet connecting the wing and bolt must not bind too tightly.

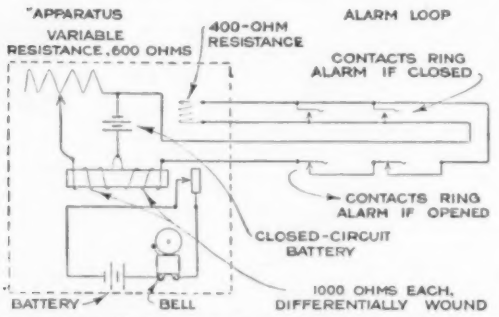
Joining Rawhide Belts

Rawhide belts have been found by one company to have a longer life than the endless cotton ones they had been using formerly, and their method of joining the ends is shown in the engraving. A slit is cut in one end of the belt, and two notches are cut out of the other end. The notched end is forced through the slit and pulled tight. This method eliminates dangerous rivets, and when the belt stretches, it is the work of a moment to pull the end through the slit, cut fresh notches, and pull the belt tight again.—S. Guy, Chicago, Ill.



Burglar Alarm Designed to Confuse an Expert

The burglar-alarm circuit shown in the drawing is novel as a burglar alarm be-



The Porch Climber and the Sneak Thief are Circumvented by the Ingenuity of This Burglar-Alarm Circuit; They cannot Cripple It by Cutting the Wires

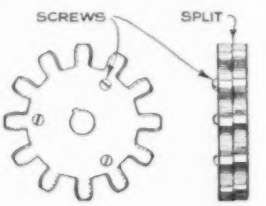
cause of its certainty of operation, and because it cannot be put out of order without giving an alarm. It is an ideal circuit for installations which include outbuildings.

The main feature is the relay; this may be a reconstructed telegraph relay, and should have two windings consisting of the same number of ampere-turns and wound on the core in opposite directions. The two inside ends of the windings should be spliced together, and this middle lead from the relay is connected to one side of a closed-circuit battery. The outside of one winding is connected to one side of a variable resistance, and the other side of the battery is connected to the resistance in the manner indicated; this same side of the battery and the free end of the second relay winding compose the alarm loop. The alarm contacts can be arranged to either open or close this pair of wires, or both open and closed contacts may be installed on the same circuit; this pair can be run to any location desired, but must have a fixed resistance shunted across the end, as shown.

When the circuit is completely connected, the relay armature should be adjusted very closely to the core, and then the variable resistance adjusted to a point where the armature will not be attracted; this operation is explained by the fact that the resistance, battery, and one relay winding form one side of a bridge circuit. The fixed resistance, the contact loop, the battery, and the other relay winding form the other side of the bridge circuit. By adjusting the variable resistance, a point is reached where both relay coils receive exactly the same amount of current from the battery, and because they are wound on the core in different directions, they neutralize each other, and no magnetic effect results. If one side of the bridge becomes in the least unbalanced, one coil of the relay will receive more current than the other, overcoming the effect of the other coil and causing the core to become magnetized. When this happens, the armature is attracted and closes a local circuit which rings the alarm.—C. M. Crouch, Minneapolis, Minn.

Taking Up Backlash in a Gear

After considerable use, the teeth of some gears wear away, and allow a certain amount of backlash when the gears are running under a varying load. Where a new gear is not easily procurable, this excess play can be eliminated by the following method:



Remove the gear and split it in half with a machine saw. This must be done carefully, to insure that the parts be of even size and thickness. File away all roughness, and grind off the faces cut by the saw. Then place the halves together again and clamp firmly, offsetting the teeth just enough to bring them in mesh properly with the other worn gear. Then drill three holes through the gear, at equidistant points, and tap one-half for machine screws. Screw them together, and the gear is ready to be replaced on the machine.

If desired, the holes in one-half the gear can be elongated, so that any further wearing of the teeth will be taken up by unscrewing the machine screws and further offsetting the teeth. The method is of course only for temporary use, but it is possible to make such gears run for quite a long period.—L. B. Robbins, Harwich, Mass.

Hand Grinder can be Used in Lathe

When I took some forgings to the lathe to turn them down, I first tested the head center and found it ran out badly. When I inquired of the foreman for the electric center grinder he told me that the only one they had was burnt out and that I would have to shift as best I could without it. The center was hardened, and I did not want to lose the time required to have

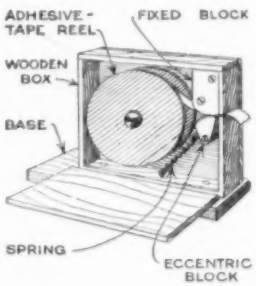
it annealed and turn it. On inquiring at the tool-room window, as a last resort, whether there was no other grinder available, I spied a small hand-operated grinder clamped to the vise bench. Taking this small grinder, I clamped it to the compound rest, which was set to the 30° angle, and by turning the grinder by hand and running the lathe, I was able to grind the center without trouble.—Joe W. Romig, Allentown, Pa.

Tapping Holes in Sheet Metal

In order to obtain a firmer hold for machine screws, when used in threaded holes in sheet metal, drill the hole with a drill somewhat smaller than the tap to be used. Then use a drift of the proper diameter to enlarge the hole. If the tap is then used, it will be found that quite a few extra threads can be cut, on account of the drift raising a bur on the metal.

Box for Holding Tape Reel

People who have frequent use for adhesive tape of paper or cloth will find the arrangement illustrated to be a great timesaver, as the end of the tape is always in sight and cannot be pulled back into the box which protects the tape from dirt and dust. It consists merely of a wooden box with a hinged lid, which may be mounted on a wooden base, if desired. The end of the tape is held between a fixed block and an eccentric, which permits the tape to be pulled out freely, but clamps it immediately when pulled or pushed backward. A light spring should be used to keep the eccentric in contact with the tape.

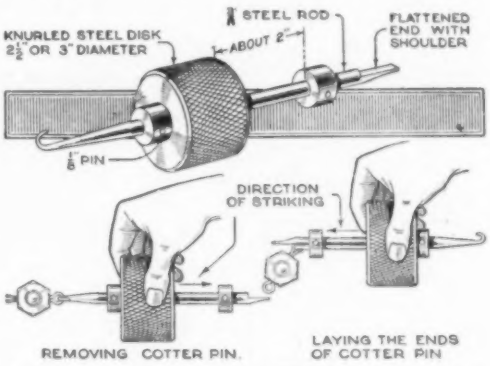


Straightening Tubular Radiator Fins

A very handy tool to have around the garage and radiator-repair shop, for straightening the fins on water-tube, or tubular, radiators is made by welding two pieces of 4 by 1 by ⅛-in. steel at right angles to the nose of a pair of blacksmith's tongs, so that the faces of the steel pieces will be parallel. Such a tool will do a very nice job of straightening, no matter how badly the fins are bent.

An Improved Cotter-Pin Puller

The tool shown in the drawing will save many minutes, and prevent many cuts and

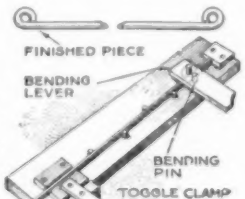


A Device for Pulling Cotter Pins, Which Combines Several Tools in One, Is a Useful Addition to the Mechanic's Tool Chest

bruises in removing cotter pins from places that are difficult to reach. A steel rod, of the diameter shown, has one end drawn to a taper, and a hook turned on it; the opposite end is filed flat for a short distance, leaving a shoulder for laying the ends of the pins. A knurled steel disk is drilled through the center so as to slide easily over the rod, and two small collars are pinned to the rod about 2 in. apart. The manner of using the tool, which comprises hammer, screwdriver, and puller, is obvious from the illustration.

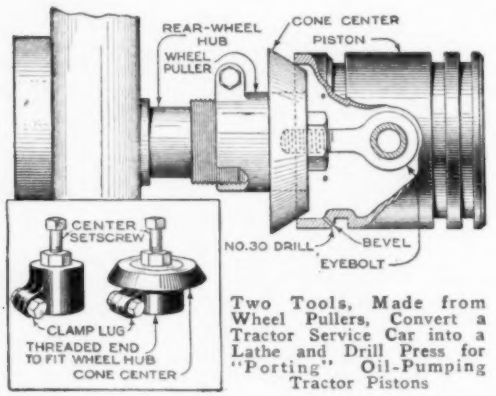
Jig for Bending Eyes in Wire

The simple jig shown in the drawing was designed to turn eyes at the ends of short lengths of wire. The wire is held securely by a toggle lever and prevented from bending during the formation of the eye by a series of staggered pegs set into the base. The bending lever is made from a piece of flat iron with a hole at one end to fit over a substantial peg, as shown. A bending pin is secured to the lever at a distance from the hole, this distance being governed by the thickness of the wire to be bent. In use, the wire is inserted into the jig and held tight, with the end against the gauge. The bending lever is then put in place and turned, on the pivot, forming the eye.—Chas. M. Greer, Buffalo, N. Y.



Auto Hub as Lathe and Drill Press

A number of tractors, sold by an agency, started to pump oil in the cylinders after the machines had been in use but a short



Two Tools, Made from Wheel Pullers, Convert a Tractor Service Car into a Lathe and Drill Press for "Porting" Oil-Pumping Tractor Pistons

time, and in these cases "porting" the pistons was resorted to as the only effective remedy. This operation consisted in drilling from four to eight holes, with a No. 30 drill, in the previously beveled lower edge of the bottom piston-ring groove. Whenever possible, the tractors were brought into the shop and this work done on a lathe, but as most of the machines were from 5 to 25 miles from the shop, it was necessary to send a service man into the field to do much of the work. The agency's service car, a light automobile, was equipped with two special tools made from a common type of wheel puller. One of the wheel pullers was centered in a lathe and the outside smoothed down as far as the clamp lug.

A steel disk, about 1¼ in. thick, was then bored to make a press fit over the top of the puller; this was pressed on and brazed to the puller, and a taper was turned on the outer circumference of the ring, as shown in the drawing. The center setscrew of the puller was removed, and its place was taken by an eyebolt, having an eye large enough for the tractor piston pins to be inserted. The second puller had its setscrew removed, and a drill chuck was firmly fixed in place, care being taken to have it accurately centered.

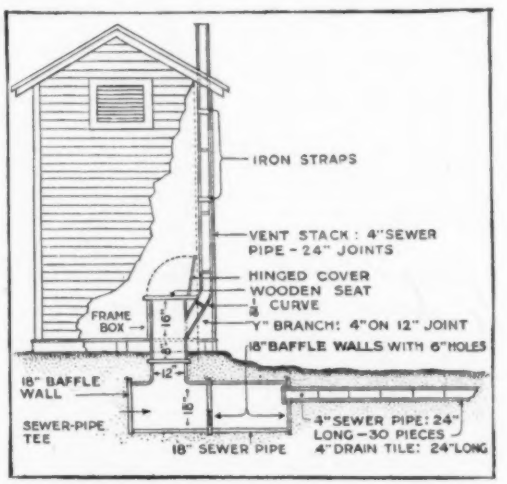
When the service man was called to a job, he jacked up one rear wheel of his car and removed the regular hub cap. The puller with the eyebolt was then screwed on the hub in place of the cap. The piston, with the piston pin through the eyebolt, was then placed over the puller and screwed on, holding the piston tight and centered on the taper, as shown in the drawing.

By starting the engine and throwing the car into "high," the piston was revolved rapidly on the end of the hub, and the edge of the piston-ring groove was beveled by holding a file against it, as in a lathe. When all the pistons had been beveled, the puller was removed and the one with the drill chuck substituted. By running the engine as before, and holding the pistons against the drill with the hands, the service man was able to do a quick and satisfactory job.—Vernon Orr, Pomona, Calif.

Sanitary Closet of Vitrified-Clay Sewer Pipe

The accompanying drawing represents an improved type of surface closet, especially designed for use in rural districts, where sanitary sewers are not available. This closet is suitable for either the home or the school. Any number of seats can be provided by using another sewer-pipe tee for each additional seat. The system should be used only where a satisfactory disposal field for tile drain is conveniently located. Existing surface-closet buildings can be used to house the system, which is installed in such cases in the same manner as in a new structure. The necessary material can be obtained from any dealer in drain tile and sewer pipe, as all the pieces are of standard size.

A box is built around the vertical pipe that projects into the building from the tee. On top of the box is placed a wooden seat, which is provided with a hinged



Surface Closet of Sewer Pipe and Drain Tile, Suitable for Homes and Schools in Outlying Districts Which Lack Sanitary Sewers

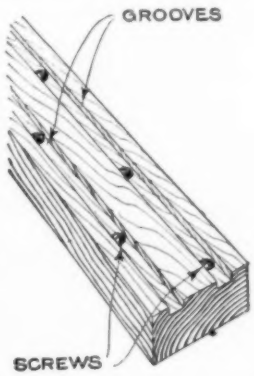
cover. The vent stack, of 4-in. sewer tile, is connected to the Y-branch of the vertical pipe by means of the 45° bend; this stack serves to ventilate the system.

The tee and the plain 18-in. sewer pipe are placed end to end, with a perforated baffle wall between. A plain baffle wall closes the opposite end of the tee, while the other perforated baffle wall is placed at the opposite end of the plain pipe, and serves to admit a 4-in. sewer pipe. To the latter are connected 30 pieces of drain tile, which are laid with open joints to permit any overflow from the system to seep into the ground. The chamber formed by the installation of baffle walls at the end of the tee temporarily holds floating matter. Liquid passes into the plain pipe through the hole in the baffle wall which separates the tee from the plain pipe.

To put the system into operation, dissolve 10 lb. of caustic soda in 20 gal. of water; each month 1 lb. of caustic soda should be poured into each closet. The contents of the closet should be agitated periodically with a rod inserted through the hole in the seat, and toilet paper only should be used. If necessary, the contents can be pumped out of the closet.—E. G. Eggert, Austin, Tex.

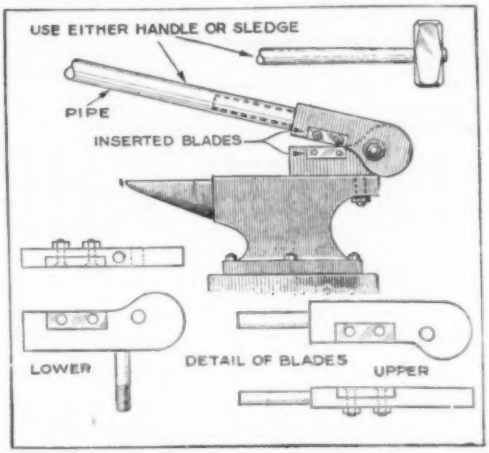
Groove Plowed for Screw Heads Replaces Countersinking

It frequently happens that numerous screws must have their heads countersunk in cleats, strips, drawer slides, and other pieces that come in contact with moving parts or against which other parts are to be placed. In such cases a considerable saving of time and labor is effected if, instead of placing each screw head in a separate countersink, a narrow, shallow groove, or when the screws are to be staggered, two such grooves are plowed in the stock. This saving is particularly pronounced where many such pieces are regularly used, because it is possible to have the stock run at the mill ready to be put on, leaving only the holes to be drilled. In addition, the screws are alined without the necessity of making further marks.



Special Shears for Use on Anvil

A pair of heavy shears suitable for cutting bars, bolts, or plates is shown in the illustration; it is used either with the handle or hammer, depending upon the material to be cut. The anvil is used as a base, and the stud attached to the fixed cutter is put through the hardy hole, and tightened by a nut.



A Convenient Substitute for a Regular Shear is Made from Materials to be Found around Any Shop

The upper and lower members are forged steel; the inserted cutters are of tool steel, hardened and tempered. A piece of pipe, of such size that it can be slipped over the shank of the upper member, is used as a handle, and the pivot is an ordinary bolt and nut.

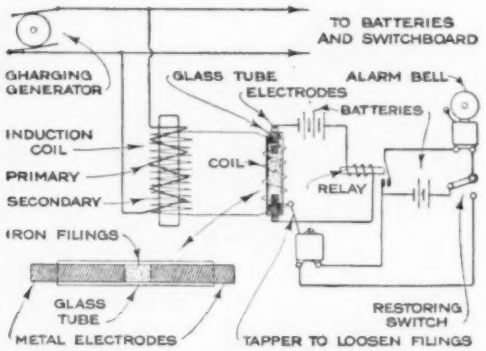
Gas-Engine Exhaust Rids Building of Rats

The manager of a grain elevator was troubled by the constantly increasing horde of rats that made their homes underneath the floor of the building. Every effort to rid the building of its destructive tenants was a failure until he conceived the idea of "gassing" the rodents with the exhaust from the gas engine of the elevator. The exhaust pipe was run under the floor of the building and fitted with a muffler. A screen of fine wire was placed over the muffler outlet to prevent fire being blown through. After this installation was put to work, the rats speedily sought other and less odorous quarters.—Chester C. Cook, McMinnville, Tennessee.

¶A little wad of fine steel wool makes an excellent eraser for removing ink lines.

Sensitive Relay Operates Alarm When Brushes Spark

Where storage batteries are used for operating telephone plants, the charging



An Unusually Sensitive Relay is Provided, So That Small Variations of Current, Caused by Sparking at the Brushes, will Operate the Alarm

generators must be watched very carefully to eliminate noise. Any slight sparking of the brushes, or dirt on the commutator, will cause all the telephones to become noisy, and will impair the transmission or talking quality of the circuits. The sparking brush causes this by making slight variations in the current flowing from the generator to the batteries and telephone switchboard. When this happens, it is very important that an attendant be notified immediately. To do this automatically, the circuit and apparatus shown was devised.

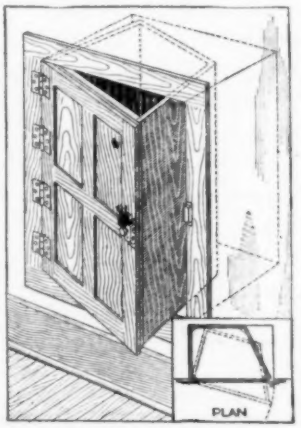
The primary of an induction coil is connected across the generator terminals. As long as the generator is producing a steady flow of direct current, it is evident that there will be no current flow in the secondary of the coil; the magnetic field produced by the primary winding must be either interrupted or varied to produce this result. A current thus produced is, however, so weak that it is not capable of operating any ordinary piece of apparatus to notify the attendant that the trouble exists.

A sensitive relay that will operate on this small margin can be made in this manner: A small glass tube, about 2 in. long, is fitted with two electrodes, as shown in the drawing. The space between the electrodes, inside the tube, should be made adjustable, and filled with iron filings, or a mixture of iron and nickel filings, like the early wireless-telegraph coherer. Around the tube is wound a coil of many turns of fine wire. The two ends of this coil are connected to the secondary of the induction coil. The two electrodes are connected to still another circuit, consisting of a battery and bell.

The operation is as follows: As long as no current is flowing through the coil wound on the glass tube, the relay will not operate, because of the high resistance of the loose iron filings between the electrodes. But if the magnetic field of the induction coil is varied in the least, the induced current in the secondary will flow through the coil on the tube, producing a field which will affect the iron filings within, causing them to become magnetized and to cohere closely. This reduces the resistance of the relay circuit, causing the relay to operate. The alarm circuit is thus closed and the bell rings. To reset the circuit after it has operated once, it is necessary to tap the glass tube containing the filings, in order to loosen them up. This can be done by mounting a bell so that the clapper will strike the tube gently when the restoring switch is operated.

Flour Bin on Cupboard Door

The sketch shows a flour bin which was constructed in a recess in the wall, which originally contained a cupboard; the shelves were removed, and the space was used to hold the bin, which entirely filled it, ¼ in. clearance being allowed on all sides. A cleat nailed along the floor of the recess took the weight of the bin when it was pushed back into the wall. In this way there was no strain upon the hinges, except when the bin was swung out yard. It had no top, so that the flour could be reached from above.



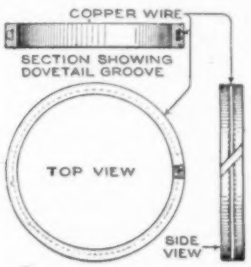
Removing a "Frozen" Valve Stem

The removal of broken or "frozen" valve stems usually presents a problem to the repairman whose equipment is limited. In such cases try this "kink": Cut a heavy nail to the proper length, and insert

it in the valve guide, with its head resting against the top of the push rod. As the engine is turned over by hand, the cam forces the nail up; this operation is repeated as necessary, and a chisel, or some other spacer, is placed underneath the nail to keep it against the end of the valve and exert pressure against it.

Copper Wire Set in Piston Rings

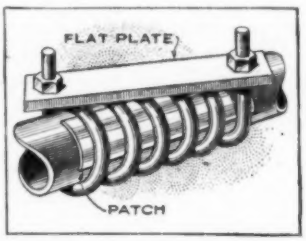
The fact that copper, when heated, expands considerably more than cast iron, is used to increase compression in an engine cylinder, prevent oil pumping, and, at the same time, indirectly check the formation of carbon by keeping oil out of the combustion chamber.



As shown in the illustration, one or more rings on each piston are chamfered to a depth of about 3/64 in. and dovetailed a trifle, so that a piece of copper wire, about No. 18 gauge, can be inserted and pushed into the groove to the other end of the split. The wire is then cut off and filed flush with the cast iron. This idea will also be found useful in cases where the cylinder has been scored or is out of round.

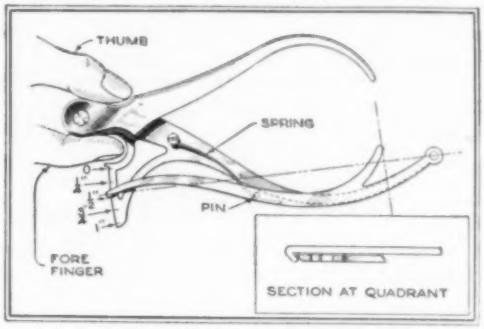
Clamping Together a Split Pipe

The drawing shows an emergency repair for a burst pipe which makes a practically permanent job and provides means for further tightening, if necessary. This repair consists of a spiral clamp of iron rod, the ends of which are threaded previous to bending it around the pipe. A flat plate, drilled to receive the ends of the clamp, is provided and screwed down tightly with nuts on the threaded projecting ends of the rod. By this means sufficient pressure can be exerted to close the split. Before applying the clamp, a patch, consisting of a piece of sheet rubber, or packing, and a metal plate bent to the contour of the pipe, is placed over the break as shown.



Automatic Caliper Shows Oversize

The caliper illustrated will be very useful in the modern shop, especially where



A Caliper Which will Show Any Variation from a Standard Size, can be Easily Made from a Common Caliper

there is a limit of tolerance on the work, for oversize or undersize. One leg of the caliper is made in the ordinary way. The other leg extends down beyond the ordinary one, and instead of a caliper point, has a hole in the end. A rivet through this hole acts as a pivot for the indicating arm, which is the feature of the tool. The indicating arm has a projection which forms the other caliper point, meeting the end of the other leg when the caliper is closed. The upper end of the indicator arm moves over a graduated quadrant, and indicates oversize or undersize.

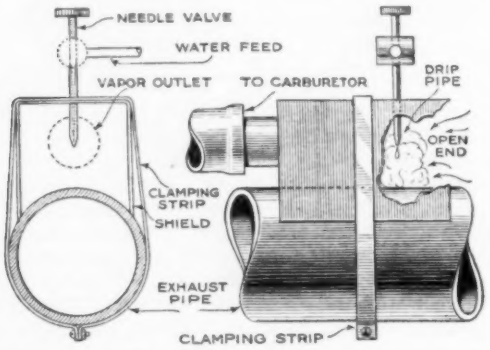
To use the caliper, say, for gauging a shaft being turned or ground to a diameter of 1 in., set the caliper to a distance of exactly 1 in., using an inside micrometer or gauge block. During the setting keep the indicator arm at zero by holding it with the index finger. Now force the caliper over the shaft being turned; the indicator arm will swing out to a point which indicates the excess of the shaft diameter over 1 in. Noting this, it is readily possible to set in the tool the proper distance to get the required diameter.

In making the tool, several precautions must be observed; the spring used must be a light one, otherwise the friction joint of the caliper may be forced to work instead of the spring. The special caliper leg must be of fairly heavy metal, to avoid the possibility of springing. The amount by which the actual excess of the diameter will be magnified on the scale depends on the length of the indicator arm, and the length from its caliper point to the pivot. If the arm is 5 in. long, for instance, and the pivot center is 1 in. from the caliper

point, then a distance of 1/10 in. on the scale will indicate an excess diameter of 1/50 in., or .020 in. If it is desired to use the caliper for showing variation from a standard diameter, the zero of the scale can be placed at the center of it, and the arm should be held or clamped at the zero point while the caliper is being set. The use of the tool as described above will then indicate whether the work comes between the required limits.

Steam Prevents Carbon in Gas Engines

The benefits of admitting moisture, with the fuel mixture, into the cylinder



A Device for Generating Steam Which is Mixed with the Fuel and Admitted to the Cylinder of a Stationary Engine, Increases Operating Efficiency, and Also Prevents Accumulation of Carbon

of an internal-combustion engine are generally recognized but seldom taken advantage of in practice. These benefits are particularly noticeable in stationary engines using kerosene for fuel, and the device shown in the drawing can be readily constructed and fitted to the engine for introducing moisture.

A metal shield is made and attached to the exhaust manifold with a clamping strip, as indicated. One end of this shield is left open, and an opening is provided in the opposite end for the attachment of a flexible pipe to the air inlet of the carburetor. Another opening is provided in the top of the shield for the insertion of a needle valve, which is connected to an elevated tank or directly to the water pipes.

In service, the engine is started, and when the exhaust pipe has become hot, the water valve is opened, and drops of water begin falling on the heated pipe; the water vaporizes instantly and is sucked into the engine cylinder. It will be necessary to adjust the needle valve so that the water will be vaporized as fast as it is fed onto the exhaust manifold. The operation of the engine should be noted meanwhile, and the carburetor readjusted, if necessary. It is advisable to connect a valve in the water line so that the water can be shut off without disturbing the needle-valve adjustment.

Moisture so introduced into the fuel mixture has a decided effect on the engine at open throttle, but on closed throttle will cause it to miss, so due allowance must be made. It increases the power of the engine and makes it run cooler. The heat of combustion increases the temperature of the steam and increases the pressure on the piston. The moisture further prevents the accumulation of carbon.

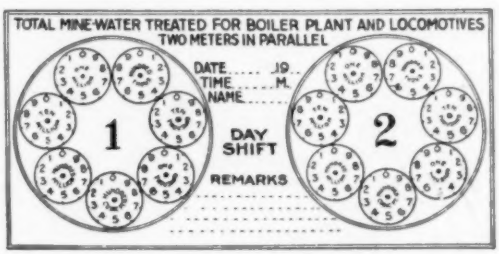
Screw Plate as Auger Handle

In the absence of a handle for turning large wood-boring augers, a screw plate can be used for the purpose. A set of worn-out dies is inserted in the plate, to grip the auger shank; the handle of the screw plate is turned down tight. The teeth of the old dies prevent the plate from slipping on the auger shank.

Charts Insure Correct Meter Readings

Very often, through carelessness, incomplete training, or ignorance, important meters in and around power houses, pumping stations, etc., are incorrectly read, causing trouble and inconvenience in keeping complete records of operation.

To overcome this trouble in one Missouri plant, facsimiles of the dial faces were printed on a daily-report sheet, the upper part of which is shown in the illustration. The sheet measures 8½ by 11 in., and there is a separate division for day, evening, and night shifts. The operator in charge on each shift was required to



To Avoid Errors in Reading Meters, Operators are Required to Mark the Position of the Hands on These Charts

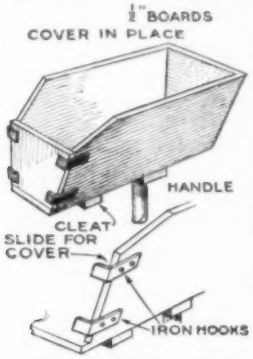
mark in pencil on the printed dials, the exact location of the meter hands, thus eliminating any possible source of error. —R. H. Poston, St. Francois, Mo.

Bacon Rind for Pump Packing

After having much trouble with the packing in a pump head, used in connection with a gasoline engine for pumping water from a well, the owner hit upon the idea of using strips of bacon rind for the purpose. This novel packing proved entirely satisfactory and outlasted the commercial product that had been used.—S. G. Parks, De Leon, Tex.

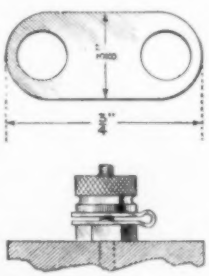
A General-Purpose Hod

A hod, slightly different from those used by hodcarriers, will find a variety of uses around the farm. It is made from ½-in. material; as shown in the drawing, it has a handle near the center, and a cleat under the open end, so that when it is hung over a stake or wagon box it can be filled easily. A cover is provided for the open end, to prevent the contents from falling out. This cover is made to fit the open end of the hod, and is held in place by four iron hooks, which are secured to the hod with screws in the manner shown. As the weight of the load comes where it is easy to carry, such a hod is very convenient when a load of loose material has to be carried on the shoulder for any little distance.



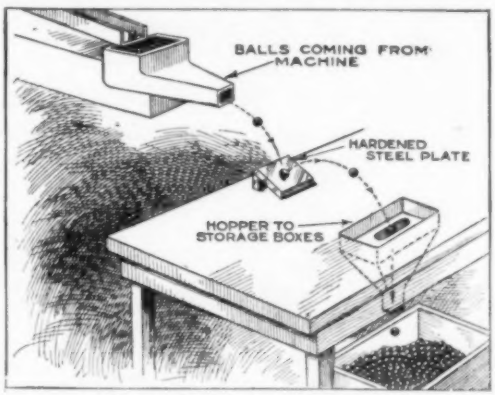
Binding Post Adapted to Cord Tips

Electrical instruments that are fitted with ordinary binding posts afford an insecure connection when used with cords that have round metal tips for terminals, as they pull out easily. To overcome this condition, a piece of copper, or brass, is cut to the form and dimensions shown, with holes at the ends for fitting the adapter over the binding-post screw after it has been bent to the shape indicated in the drawing. In use, the adapter is slipped over the binding-post screw, underneath the thumbnut.—Thos. W. Benson, Philadelphia, Pa.



Automatic Testing of Steel Balls

A factory received an order for a large quantity of hardened steel balls, the contract specifying a certain degree of hardness. As the time was limited, it would have been impossible to run each ball through a testing machine, but after a little testing and experimenting with perfectly hardened balls, the device shown in the drawing was rigged up, and the balls were tested automatically as they came from the machines. The finished balls ran from the machine to a funnel-shaped spout, the outlet of which was slightly elevated, and just large enough for one ball to come through at a time. The ball, on coming out, naturally described an arc in falling onto a hardened steel plate underneath the spout, as shown. On striking this plate the correctly hardened balls bounced off into a tray, sunk flush with the bench, but, if they were too soft, they would not bounce far enough to enter the tray and, if they were too hard they would bounce too far. Thus, only the perfect balls fell into the tray.—J. H. Moore, Toronto, Ont.



Correctly Hardened Balls Bounce into a Chute; Imperfect Balls Bounce Too Far or Fall Short of the Hopper

Leaks in Automobile Intake Cause Cylinders to Miss

One source of automobile trouble, which is very difficult to locate, is the "missing" of one or more cylinders. When the explosions are noticed to be irregular, the driver usually examines the carburetor and the ignition system, but often fails to correct the fault. This trouble is sometimes occasioned by the faulty connection of the intake pipe. Leaks at either the carburetor or cylinder end will cause "missing." The trouble, however, is more

often at the cylinder end, where the gasket may be damaged or the nuts on the studs may be loose. In either case, the extra air drawn through the leak causes the failure to explode. When the gasket is renewed or the nuts tightened, the trouble is usually cured.

Bicycle Motor for Grinding

An itinerant cutlery grinder has adapted a motor-driven bicycle to meet the requirements of his business by adding a grinding wheel. As shown in the engraving, the engine is mounted directly above the rear wheel, to which it delivers power through a chain and sprocket. When the grinding wheel is to be used, the rear wheel of the bicycle is raised from the ground by lowering the stand, and the engine started.

An Itinerant Cutlery Grinder has Adapted a Motor-Driven Bicycle to Meet the Requirements of His Calling by Attaching a Grinding Wheel

Insulators Made from Broken Phonograph Records

A detail worth remembering when insulating washers are required in electrical repairs, where none of the usual insulating materials are at hand, is that the material used in making phonograph records is a very good insulator.

This material is especially useful to the amateur automobile mechanic, for replacing lost insulation, such as the blocks which keep spark-plug wires from resting on the cylinders; for placing under terminal screws; in fact, any place where small pieces of insulation are required, this material can be used.

Box for Developing Motion-Picture Films

Under certain circumstances, it is necessary to develop short lengths of motion-picture film immediately after exposure, in order to obtain samples of the camera's work. When a laboratory is not close at hand, as is often the case, a portable dark room, or developing box, designed by a western camera operator, is a great convenience. This device consists of a hardwood box, 15 in. long, 12 in. wide, and 6 in. high, fitted with a hinged cover that can be fastened down with hooks and eyes. In the front of this box is a hole, 10 in. wide and 6 in. high, along the edges of which is tacked a piece of light-proof cloth, sewed together in the form of a box. At its unattached end, are two sleevelets, designed to admit the forearms, around which they are held by elastic bands. Inside the wooden box are two wide-mouthed bottles, one containing a developing solution, and the other a hypo bath. The box cover is lined with velvet.

To operate the contrivance, the film magazine is placed on top of the box, and the end of the film pushed into it through a slit in the velvet lining. The operator thrusts his hands into the sleevelets, grasps the end of the film, and places it in the bottle containing developer. When sufficient time has elapsed for the development of the negative, the film is placed in the other bottle, where it is allowed to remain until the fixing process is completed. This requires but a few minutes. The cover of the box is then unfastened and the strip removed.

A Compact Dark Room for Motion-Picture Camera Operators: Inside the Wooden Box Are Bottles Containing Developing and Fixing Solutions

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

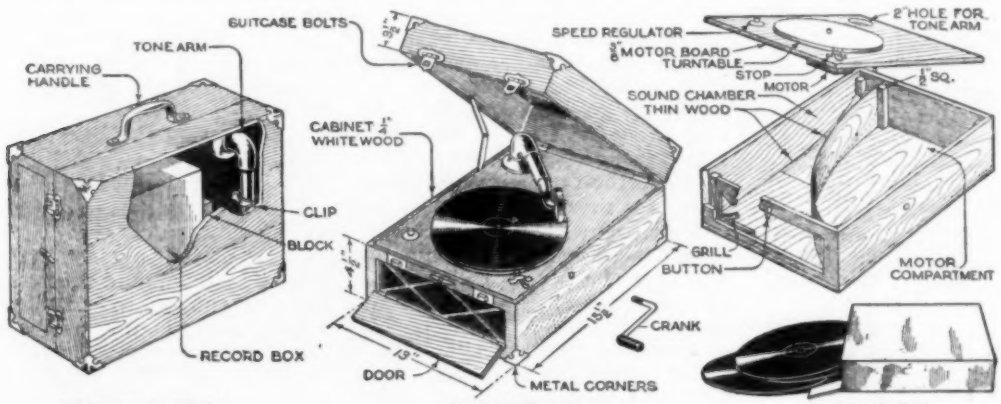
Cheap Portable Phonograph for the Camp

BY H. E. MENDE

AROUND the camp fire, or drifting down some moonlit stream in a canoe, the lover of outdoor life feels the need of music to complete the enjoyment of his outing; if he is not a player of some instrument, he must depend upon music of the "canned" variety, and it is the purpose of this article to describe the construction of a portable phonograph, small and light enough to be easily carried. Anyone who is at all handy with tools can build this machine, and while dimensions are given in the drawing, they are merely suggestive, as it is quite possible that some departure from them will be required, owing to the variation in size of the mechanical equipment.

The first consideration is the cabinet. This may be made of any kind of wood, although whitewood is suggested on account of its lightness. If lightness is a prime consideration, ¼-in. material is advisable, but if lightness can be subordinated to strength, ⅜-in. material will, of course, be better. As shown in the drawing, the inside corners of the cabinet are reinforced by square posts, which also serve as supports for the motor board, which is attached with screws.

The necessary mechanical parts, such as a spring motor, turntable, reproducer, tone arm, crank, and other accessories, may be taken from an old machine or bought from a dealer in phonograph supplies. If this equipment is purchased, the cost will be somewhere around $5. Make a 1-in. hole in the motor board for the turntable spindle, and place the spindle so that the crank side of the motor is at the right; then, with a pencil, mark the location of the motor bolt holes; after drilling these, bolt the motor in place, using one or more rubber washers on the bolts between the motor and the bottom of the board. The height of the upper edge of the turntable from the top of the motor board should be about ½ in., washers being added or removed to obtain this height, which is just sufficient to allow proper clearance between the turntable and the motor board when the former is in place on the spindle. Cut a hole at the left rear corner for the tone arm; this hole should be so located that, when the tone arm is in place, the needle holder on the reproducer will be just about in line with the turntable spindle. The speed regulator and turntable stop are located



Many Times the Lover of Outdoor Life Feels the Need of Music to Complete His Enjoyment of Nature's Charms; If He Is Not a Player of Some Instrument He must Depend on "Canned" Music. This Phonograph Is Light Enough to Be Readily Portable and Strong Enough to Withstand Considerable Rough Usage

on the motor board with reference to the construction of the motor, although the location shown will be found to represent average practice. After a hole has been drilled through the right side of the cabinet for the winding crank, the motor board and its attached equipment is completed and ready for installation.

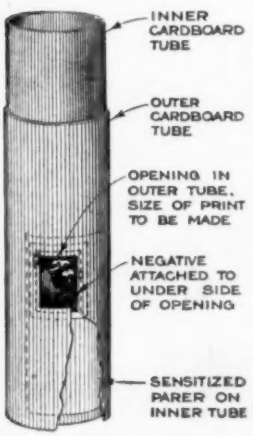
As shown in the drawing, the corner posts of the cabinet are short enough to permit the motor board to come flush with the top. The sound chamber, or "horn," is shaped according to the space occupied by the motor, and may be made from two strips of thin wood, heavy cardboard, or metal. The bottom strip curves upward from about the center of the box to the rear, the side strip being curved to clear the motor; these strips are attached with glue and small screws. A small door, as indicated in the drawing, is provided at the front of the cabinet, and since some backing is required for the door when closed, an ornamental grill serves the double purpose of adding to the appearance and preventing the door from being pushed in. A small metal button holds the door when closed.

Owing to the variation in the height of various tone arms, it is quite likely that some deviation from the dimension given for the height of the lid will be required, and it is therefore best to delay making the lid until the motor board has been installed, so that the exact amount of space can be determined and an additional $\frac{1}{8}$ or $\frac{1}{4}$ in. allowed for clearance. A metal clip, such as the one shown in the drawing, is attached inside the lid, for holding the tone arm when the lid is closed. As the machine without records would be useless, a record box, made from cardboard, thin wood, or metal, of sufficient depth to fill the space between the turntable and the lid and wide enough for a 10-in. record, should be made. A small block attached inside the lid, as shown, prevents the record box from shifting; such a box will hold a dozen or more records. The machine is completed by staining and varnishing as desired, or by covering with leatherette, and by the addition of a suitable carrying handle, suitcase bolts, metal corners, and such other fittings as the taste of the builder may suggest.

Such a machine, properly made, will weigh about 10 lb., will be strong enough to withstand considerable rough treatment, and will be found one of the most valuable and entertaining adjuncts to any outing party.

Making Gummed Stamp Photos

Gummed stamp photos that can be applied to stationery, business cards, etc., are easily printed from any small film negative and, as a dozen or so prints can be made on one 4 by 5-in. sheet of paper, the cost per print is slight. Two cardboard tubes will be required, one of them being small enough to fit snugly inside the other. An opening, the size and shape of the prints to be made, is cut in the outer tube, to the underside of which the film is attached with strips of gummed paper. A sheet of single-weight, sensitized paper is attached by the corners to one end of the inner tube, sensitized surface up.


INNER CARDBOARD TUBE
OUTER CARDBOARD TUBE
OPENING IN OUTER TUBE, SIZE OF PRINT TO BE MADE
NEGATIVE ATTACHED TO UNDER SIDE OF OPENING
SENSITIZED PARER ON INNER TUBE

To make the prints, the tube to which the paper is attached is inserted into the tube containing the negative, so that the film will be over the upper left-hand corner of the paper. Expose in the usual manner, and then turn the inner tube to the left just enough to protect the exposure previously made; this operation is repeated until the opposite edge of the paper is reached, when the inner tube is drawn out and another row of exposures is made. When the prints have been developed and treated in the customary manner, they are allowed to dry thoroughly, in preparation for the gumming operation.

The gumming, or coating the backs of the prints with adhesive, requires a sheet of celluloid; this is thoroughly cleaned and the backs of the dry prints are given an even coating of thin mucilage. The gummed prints are placed against the celluloid, mucilage side down, and pressed into contact, but not enough to squeeze the mucilage out around the edges. Allow the mucilage to dry and strip the prints from the celluloid. The celluloid sheet should be larger than the paper and may be used repeatedly by cleaning with warm water, and drying, each time it is to be used. The completed prints are

separated with a pair of shears or on a trimming board.—Wm. Underwood, Tunnel Hill, Ill.

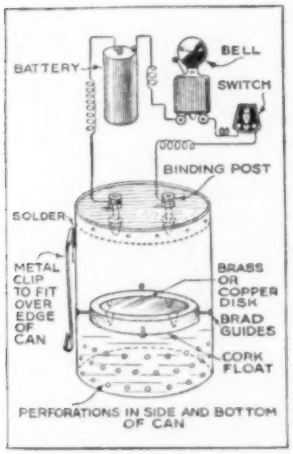
Making Lawn Mower Cut Easily

It often happens that a lawn mower, even when newly sharpened, chokes very easily and requires to be backed up and run forward again several times when cutting, especially in heavy grass.

This can be cured by taking a heavy triangular file, and deepening the grooves in the traction surface of the driving wheels, causing them to take a firmer grip, and forcing the barrel to revolve; this simple remedy will save much back-breaking work on the part of the operator.

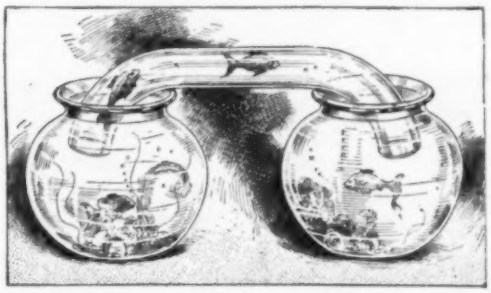
Alarm Prevents Overflowing of Ice Box

An effective alarm that can be attached to or detached from the drip pan of an ice box without danger of affecting its operation is made as shown in the drawing. An ordinary tin can is obtained and one end is cut away, close to the edge, and the bottom and lower part of the can are perforated to permit water to enter. A large, flat cork, of smaller diameter than the can, is obtained and given a coat of shellac, or melted paraffin, and four wire brads are inserted at diametrically opposite points, as guides. A brass or copper disk is made as shown, with four or more points around the edge, which are driven into the cork. The top of the can is closed by a disk of wood that has been waterproofed by dipping in melted paraffin; this disk contains the binding posts, the lower ends of which establish a circuit, when the water level in the pan floats the metal-surfaced cork to the proper height. A metal clip, to hold the device to the side of the pan, may be soldered to the side, as indicated, or it may be merely set in the pan. This alarm is intended to be used in connection with the simple bell circuit shown.—Geo. E. Perkins, S. Bound Brook, N. J.



Goldfish Travel from Bowl to Bowl

An interesting and entertaining arrangement, that permits goldfish in one bowl to travel to another, is effected as shown in the drawing. An extra fish bowl is provided, and filled with water to the same height as the one containing the fish. Then a piece of glass tube, of large diameter, is made into an elongated "U," by heating where the bends are to be, and slowly bending. This U-shaped tube, after it has cooled, is filled with water and one end is placed in each bowl. The water will remain in the glass tube, even though above the level of the two bowls, so long as the water in both is kept above the ends of the tube.—H. M. Bixby, St. Louis, Mo.



An Arrangement That Permits Goldfish in One Bowl to Swim to Another through a Glass Tube

Carrier for Heavy Barrels

Barrels of fruit, or other commodities, that require careful handling by two men, being difficult to handle by gripping the chimes, the holder shown in the drawing provides a convenient means of moving such containers. The iron framework, as well as the handles, can be made by any blacksmith, from light stock. The handles are attached to the frame with iron straps of convenient length, and adjustable straps are provided for holding the barrel in place when the carrier is in use, as indicated. If desired, the upper side of the horizontal part of the rods can be flattened to prevent slippage.

The Motorization of an Old Buggy

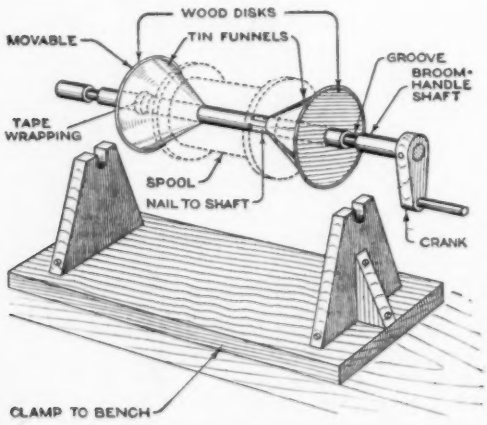
The illustration shows the "Gastropoda," as it has been termed by its builders. This novel vehicle, which appears to be, at first glance, a hybrid of the "one-hoss shay" and the early automobile, is nothing more serious than an ancient buggy which has been motorized by the addition of a single-cylinder motorcycle engine. The strange-looking vehicle is driven by a belt from the jackshaft under the seat, power being transmitted to it from the engine by another belt. The steering gear is the combined product of several junk piles and consists of some gas pipe, an old bicycle sprocket or two, and some chain—but it works. Fifteen miles an hour is claimed as the "Gastropoda's" speed record. The motorization of this relic of the pre-gasoline era was accomplished by the youthful designers at insignificant expense and without much alteration to the vehicle itself.

The "Gastropoda," Seemingly a Hybrid between the "One-Hoss Shay" and the Early Automobile Is Really Nothing but an Old Buggy Motorized

Winding Hollow Wireless Coils

The radio fan's enthusiasm for making his own apparatus does not begin to suffer until he starts winding coils on hollow cores. With the assistance of the winder shown in the drawing, coils of almost any length and diameter can be quickly and neatly wound.

A piece of old broom handle makes a suitable shaft, and grooves are cut about 3 in. from each end to fit into the endpieces of the support. Two tin funnels are obtained, and the tips are cut off so they will slide onto the shaft; one of these funnels is nailed in place on the end where the crank, or pulley (if power is to be used), is to be attached. The other funnel moves freely on the shaft, and can be removed entirely. A wooden disk with holes at the center is attached inside the large end of each funnel, for rigidity. A simple support is made, such as the one shown in the drawing, with the endpieces a suitable distance apart. In use, the movable funnel is slipped off and the spool is put on; the funnel is then replaced, and pushed up until the spool is held firmly in place between the two funnels, as shown. The movable funnel is held in place by wedges, or by a wrapping of tape around the shaft, and the winding is proceeded with in the usual manner.—James B. Keller, Alexandria, La.



A Coil-Winding Machine That Simplifies the Wireless Fan's Job of Winding Hollow Coils: The Apparatus Is Inexpensive and the Results Satisfying

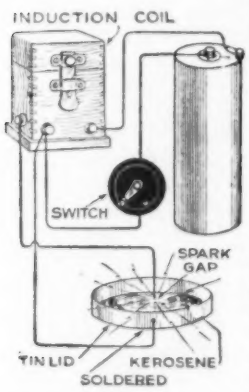
Tanning Rabbit Skins

Rabbit furs can be made up into garments or used for garment linings, as well as for the trimmings on muffs and other fur pieces. Most attempts at tanning these skins have not been very successful, but the following process has been found to give satisfactory results: First, the flesh side of the hide is gone over and all possible flesh is removed by scraping, great care being exercised against cutting through the skin. After scraping, rub in salt, roll up the pelts, and put them away for 24 hours. A solution of ½ oz. of sulphuric acid, 2 lb. common table salt, 4 oz. powdered alum, and 5 gal. water is mixed in a large container.

After the ingredients have been thoroughly dissolved, the mixture is stirred and the hides placed in it. The container is covered and set away. The hides are allowed to remain in the solution for nine or ten days and should be stirred around two or three times a day during this period. When the hides are removed, they are washed with warm water and soap, this process being repeated two or three times. The hides are then tacked out and stretched, and the flesh side wiped dry with woolen cloths. When dry, the flesh side is gone over with fine sandpaper, using care against rubbing too deeply. This completes the process, and the hides are ready to be cut and worked as desired.—Robert Page Lincoln, Minneapolis, Minn.

Producing Intermittent Lightning

With the assistance of a small jump-spark, or induction coil, the effect of lightning flashes can be obtained in the following manner: A shallow tin lid, containing about half a teaspoonful of kerosene, is connected to one wire from the coil, in the manner shown; the other wire from the coil is arranged over the oil, with a small gap for the spark to jump across to the oil. When the switch is closed, the spark passes between the oil and the wire above it, volatilizing the oil which ignites with a flash, and as suddenly dies away; as long as the switch is closed this intermittent flashing continues. A good, hot spark is required, and the spark gap should be very short.—K. McLean, Caledon, S. Africa.

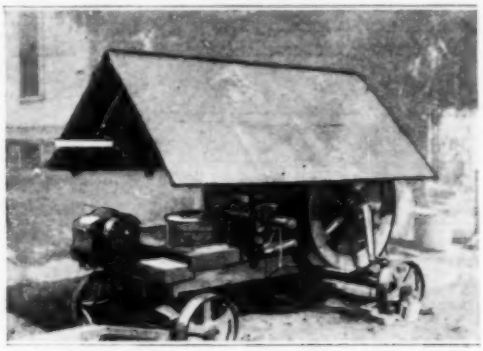


Cutting Large Saplings with Penknife

Saplings of considerable size can be cut with an ordinary penknife if they are bent over and cut where the bend is sharpest. Either the edge of the blade or the point can be used, the knife being worked back and forth like a saw in the former case, while in the latter the cuts should be made in the same direction. The wood will part in threads, leaving small splinters sticking from the cut ends.

A Light Roof for a Portable Engine

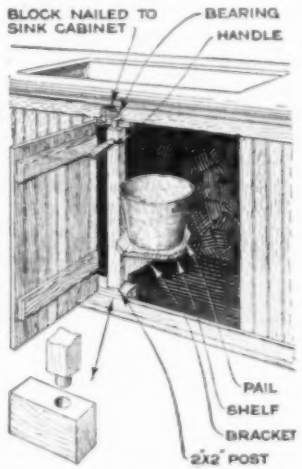
A removable roof, for protecting a portable engine from the weather when left exposed, is used as in the engraving. This roof is made of tin, over a light, but strong wooden frame, which is designed to rest on top of the engine when in place. Such a covering provides shelter and protects the engine from the elements wherever it may be on the farm.—Mrs. Ruth Darling Shultis, Grand Junction, Colo.



A Removable Roof for Protecting a Portable Gasoline Engine from the Ravages of the Elements When the Rig is Left Exposed on the Farm

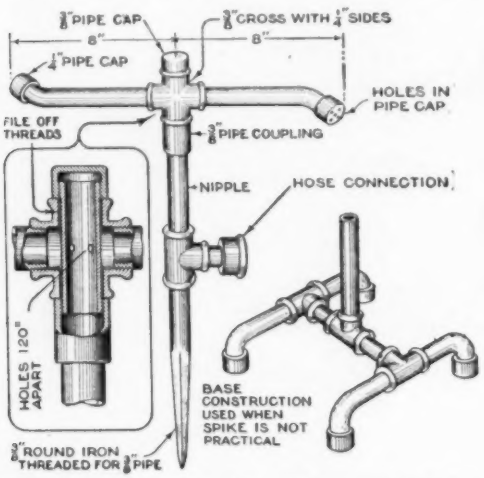
Pail Concealed under Sink

In order that the garbage pail may be kept convenient, and at the same time out of sight and away from flies, the arrangement shown in the drawing was installed underneath the sink cabinet. The revolving post is provided at each end with a bearing about 1 in. long and these fit into holes drilled in two blocks, which are nailed to the inside of the cabinet in the manner shown. A bracket and shelf for holding the bucket are attached to the post with screws, and a handle is provided at a convenient point near the top, so that the device can be turned to bring the bucket from its place of concealment.



Making a Lawn Sprinkler

The owner of a well-kept lawn exhibits a pardonable pride in having it referred to as "the nicest lawn on the street," and he accomplishes this largely by keeping the grass well moistened during warm

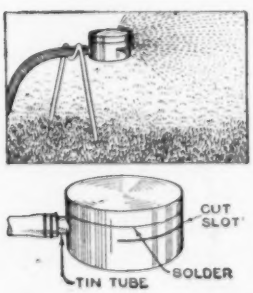


Whirling-Spray Lawn Sprinkler Made from Small Pipe and Fittings: No Machine Work of Any Kind is Required and All Parts are Easily Obtained

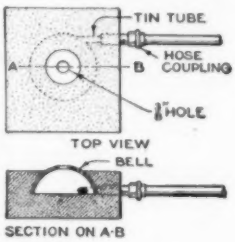
weather, otherwise it would dry up and assume a hopelessly "burnt" appearance.

One of the simplest lawn sprinklers may be made from a shallow can provided with a thin slit in the side which extends about one-fourth of the circumference, as shown. On the opposite side of the can a hole is cut and a piece of tin tube, or pipe, is soldered to it for attaching the hose. Under ordinary pressure this spray will moisten an area of about 150 square feet.

Another simple sprinkler is made from the bell of an old alarm clock; some sand, cement, and a female hose coupling being also required. The hole in the bell is reamed out to about 3/8 in. and a notch is cut in the edge to accommodate a piece of tin bent into a cylinder over a bolt. A small box form is partly filled with a half-and-half mixture of moistened cement and sand. The bell, nozzle, and hose connection are set in place, and the form is filled level with the cement mixture. A hole will have to be cut in the side of the form to allow the hose coupling to project.



A more ambitious effort is the whirling sprinkler made of pipe and pipe fittings. No machine work is required and the parts are readily obtainable. The sprinkler head consists of a 3/8-in. cross, with 1/4-in. side outlets, having the threads filed out with a round file until the cross slips easily over a 3/8-in. nipple, which has also been filed until it is round and smooth. The nipple is of such a length that, when it has the cap screwed on and the other end is screwed into a sleeve, the cross will just fit between them. Three 1/4-in. holes are drilled in the nipple, as nearly as possible 120° apart, on the center line of the side outlet pipes, so that one hole will always be open to each side of the cross. The holes in the outlet pipes and caps are drilled with a 1/16-in. drill. If possible, it is suggested that the holes be made with a smaller drill, but unless extraordinary care is exercised, or a sensitive drill press is available, the size mentioned is about the smallest that can be used in a hand drill, and even then considerable care must be used to prevent drill breakage.



If a lathe is available the cross is held in the lathe chuck and bored to 21/32 in. and its ends turned true. A piece of 7/8-in. cold-rolled round steel is then turned to fit the cross, being turned down far enough to project through the cross and leave room for a collar; a 3/8-in. hole is then drilled in the other end to intersect the three 1/4-in. holes that are drilled in line with the horizontal openings of the cross and 120° apart, as described. This end is then turned to 1/2-in. pipe size and threaded with 1/2-in. standard pipe thread. A collar is then made to fit on the end of the rod projecting through the top of the cross; this collar holds the sprinkler together.

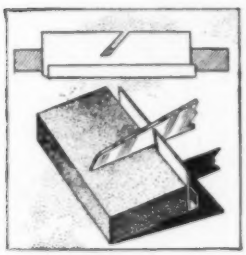
¶Clear glass (or celluloid) on a photographic negative indicates underexposure.

Making Polishing Wheels

Wheels for polishing metal parts are easily made by using a leather-faced wooden disk covered with abrasive of the desired grain. A hardwood disk of suitable thickness and diameter is provided, and a central hole is drilled through it to fit on the shaft on which it is to be used. A piece of leather belting is soaked in water until soft, and after it has been stretched until some of the water has been removed, it is glued to the face of the wheel. The leather is made a trifle longer than the circumference of the wheel, and the ends are tapered, or scarfed, so that when they are made to overlap, a smooth joint will be obtained. The polishing wheel is completed by giving the leather surface a thin coat of warm glue and covering it evenly with the abrasive powder while the glue is still wet. The wheel is then hung up and allowed to remain until the glue has dried.—R. C. Liebe, Goldsboro, N. C.

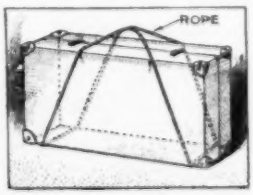
Device for Sharpening Scissors Assures Correct Bevel

When sharpening scissors, the amateur often has difficulty in discovering the correct angle at which the blade should be held on the stone, and in keeping the blade in this position during the whole time of sharpening. A piece of sheet iron, bent as shown, and having a slot cut at the proper angle, will be of great assistance in getting a proper edge on the shears or scissors. If other bevels are to be used, other slots can be cut in the same gauge.



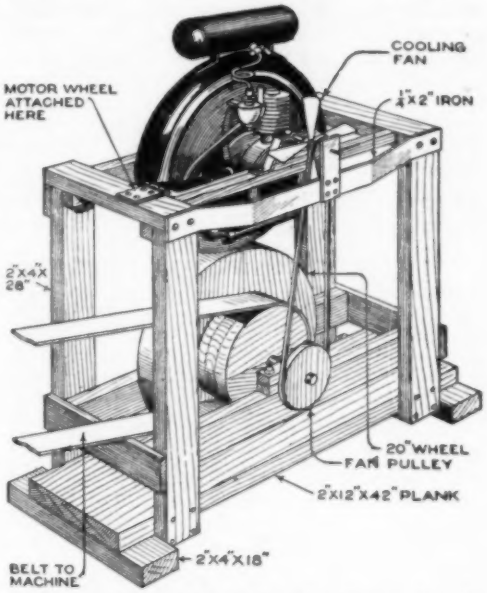
Rope Handle for Suitcase

An emergency handle for a suitcase or handbag is easily made from a short piece of rope. The ends of the rope are tied together, to form a circle. Catch up the rope on opposite sides, leaving the ends to form loops, which are slipped over the ends of the suitcase in the manner shown in the drawing.



A Motor Wheel as a Power Plant

Only a few minutes are required to remove a motor wheel from the bicycle on



A Bicycle Motor Wheel Provides Power for the Operation of Various Light Machines, Such as a Feed Cutter or Washing Machine

which it is used, and set it up to furnish power for operating a washing machine, feed cutter, or other light machine.

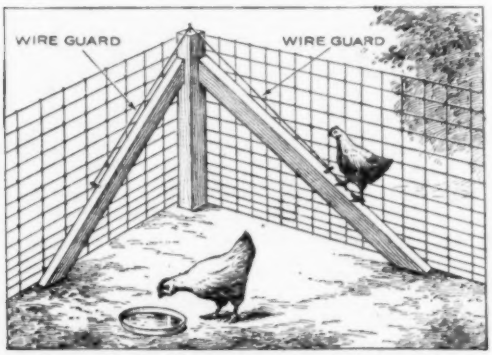
A substantial wooden frame is built, and securely assembled with nails or bolts. Two pieces of strap iron are bent to form brackets and bearings for the cooling fan. The cooling fan consists of the rear hub of an old bicycle, to the sprocket of which the sheet-metal fan blades are attached. The bracket, for attaching the motor to the frame, is made by fitting a piece of sheet iron to a hinge, and slipping the other end of it over the attaching bolt on the motor. The pulleys are made by cutting a number of disks from a 1-in. board, and nailing them together, so the grain will be at right angles. These pulleys should be faced with several layers of canvas, tacked and glued in place. A piece of ¾-in. pipe forms the shaft, and should be supported on metal or hardwood bearings, as shown. The pulleys are attached to turn with the shaft. An easy way of doing this is to cut a mortise on each side of the pulley, to fit a large-size nut, which slips over the shaft and is held in place with a setscrew through one of its sides.

When ready for use, the bracket is slipped over the attaching bolt of the motor, which is lifted to its place in the

frame. The bracket is bolted to the frame. The tire of the motor wheel should be in the center of the wheel, and exactly in line with it. The motor is lifted at the rear, and started by hand. If not allowed to overheat, using the motor for power purposes should not injure it more than normal usage on the road.

Wire Guard Prevents Poultry from Escaping

Poultry kept in an inclosure sometimes form the habit of walking up the braces

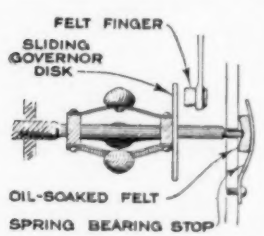


A Piece of Wire Fastened to the Braces of Corner Posts in the Poultry Yard Makes It Impossible for Fowls, That have Formed the Habit of Walking up the Braces, to Escape

at the corner posts, and flying out. A simple means of preventing this is shown in the drawing. A piece of scrap wire is fastened to each brace and to the top of the post, so that the chickens are thrown off when they attempt to climb up the brace.

Quieting a Phonograph Motor

Many phonograph motors, after being in use for some time, develop strange noises which can often be heard above the selection being played. Aside from improper oiling, one of the main causes of these noises is wear at one end of the governor shaft; this wear permits so much end movement that the slack in the worm gear produces an annoying clatter, or hum. A factory "dodge," to eliminate this backlash, is to insert a piece of oil-soaked felt between the bearing stop and the end of the governor shaft. The bearing stop is loosened and pushed to one side, and a piece of oil-soaked felt, about ¼ in. square, is set against the end of the shaft; the bearing stop is pushed back to its original position, to hold the felt in place, and tightened up. The pressure of the springy felt against the end of the shaft takes up the backlash in the shaft, and causes the motor to operate quietly.—L. B. Robbins, Harwich, Mass.

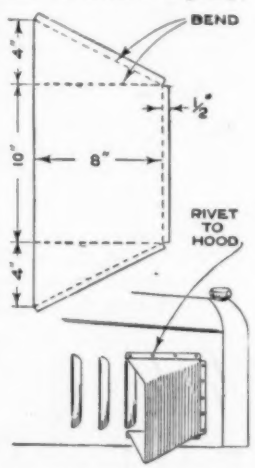


A Cheap Radiator Cement

While the application of radiator cements which are mixed with the cooling water is generally frowned upon, there are times when such a cement can be used without injury, for stopping very small leaks. A cheap and effective radiator cement of this character can be obtained from almost any druggist in the form of water glass, or sodium silicate. A pint of the water glass is poured into the radiator, which should be filled with water; then start the engine and let it run for a few minutes until the cement circulates to all parts of the cooling system. Allow the water to remain in the radiator overnight, drain off and refill with clean water in the morning.

Deflector Improves Cooling System of Automobiles

Automobiles equipped with thermo-siphon cooling systems overheat rapidly, when traveling through mud or sand in "low," and in hot weather. This overheating can be largely reduced by increasing the circulation of air through the radiator and around the engine, and the simplest way of doing this, short of removing the hood, is to cut an opening in the latter and attach a deflector over it, as indicated in the drawing. With such a deflector mounted on each side of the hood, the draft caused by the movement of the car insures good cooling. The deflectors are partly concealed by the mudguards and are not unsightly.—Thos. W. Benson, Philadelphia, Pa.

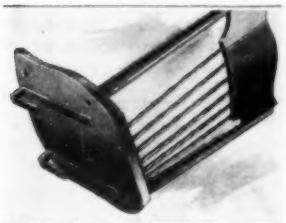


Tobacco Humidors Make Cookie Jars

The glass jars in which several popular brands of smoking tobacco are packed, make fine containers for candies and cookies, but without the clamp and rubber gasket with which the jars are usually fitted, they are not air-tight. By using a medium grade of valve-grinding compound the covers can be made air-tight with little trouble. Proceed as when grinding a valve; spread the compound thinly on the top lip of the jar and rotate the cover, applying light pressure, lifting it occasionally and giving it a quarter turn. After grinding a few minutes, wipe off and examine the grinding marks. When they make a continuous trace around both the top of the jar and the cover, finish with fine grinding compound.—C. S. Bartless, Corinth, Miss.

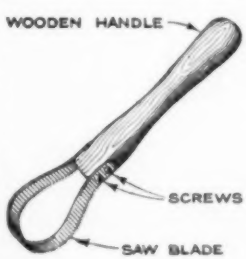
Boat Seat Made from Chair

A comfortable seat for the boat, which is readily attached to or detached from the regular thwart, is made as shown in the photograph, from an old chair. Iron clips are made and securely attached to the bottom of the chair seat with screws or, better still, with round-headed bolts. A seat of this description is particularly convenient when fishing or hunting. The same kind of seat can be slipped onto the ordinary board seat of a farm wagon.



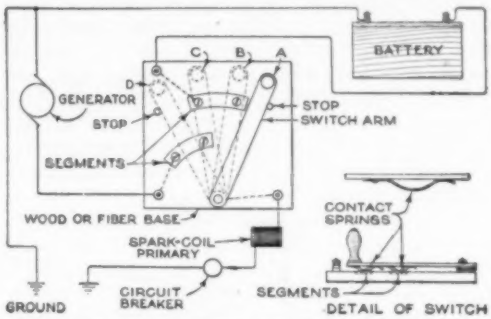
Pot Scraper Made from Saw Blade

A scraper for cleaning kitchen utensils, such as pots, kettles, pans, and the like, may be made from a piece of broken buck-saw blade attached to a short wooden handle, as shown in the drawing. The steel being thin and flexible, it is easily made to conform to the curved sides of a vessel and reach every part except sharp angles. The saw teeth may be filed off or left on as desired. However, both edges can be used.



Switch for Battery Charging on Motorboat

To prevent the storage battery from exhausting itself through the generator windings when the engine is stopped, the simple switch shown in the drawing will be found to work successfully on motorboat circuits where the combination of generator and storage battery is used.



Simple Switch to Prevent the Storage Battery from Exhausting Itself, for Motorboat Circuits Where Both Generator and Storage Battery are Used

The switch base is made of wood, fiber, or other nonconducting material. A switch lever is pivoted to the bottom with a small bolt, and wired to a binding post at some convenient point. Two segments of copper, or brass, shaped to follow the sweep of the lever, are fastened to the base with countersunk screws. Each segment is connected to a binding post. The storage battery is connected to the upper segment; the generator, or dynamo, to the lower one, and the switch lever to one side of the ignition circuit. The wiring is completed as shown. Light spring-brass fingers are riveted to the underside of the switch lever, to bear against the segments and insure good contact.

When the switch is placed at A, all circuits are open. At B, the battery is thrown into the ignition circuit so the engine may be started; at C, after the engine is running, both battery and generator are in the circuit, and the generator will charge the battery. When the battery is sufficiently charged, place the lever at D, which cuts out the battery and runs the engine from the generator alone. To stop the engine, push the lever back to A; this not only cuts out the ignition circuit but disconnects the generator from the battery as well, and prevents the passage of current.

A pin stop at each side of the switch base prevents the lever from dropping over too far.

Community Radio Stations for Amateurs

By Samuel W. Beach

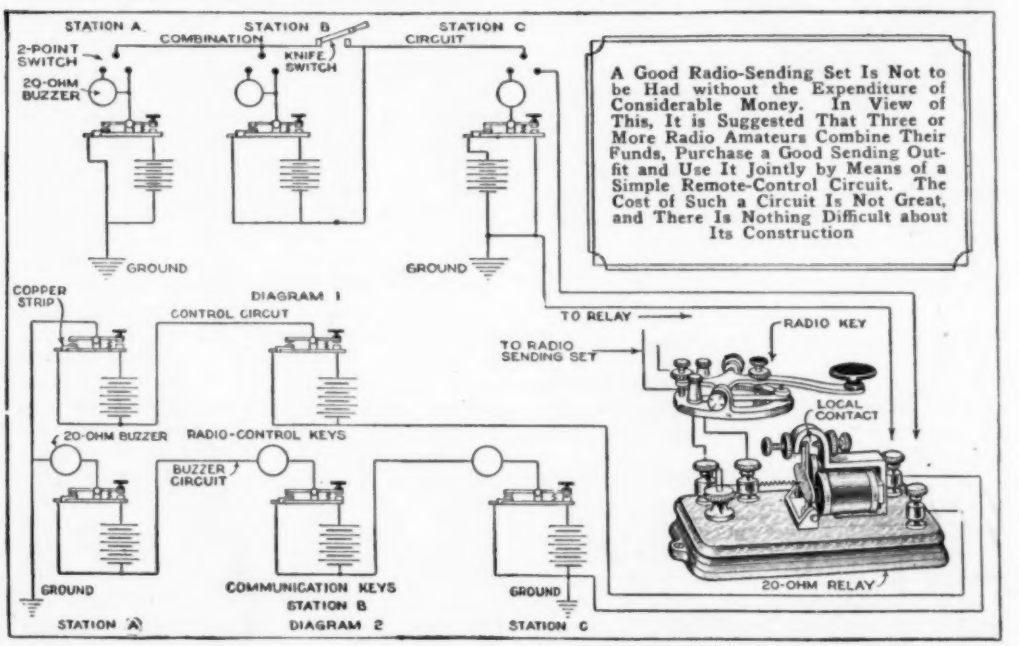
IT takes a neat sum of money to install a good, substantial radio-sending set, and its upkeep demands unceasing expenditure. Many have not the funds to buy a sending set at all, while others must content themselves with sets so naked of essential appliances as to be incapable of proper adjustment, and radiating waves so coarse and broad as to interfere with all receiving stations within their radius of action.

The principle of remote control for radio transmission, as used aboard battleships, and between many commercial and naval shore stations, suggests an excellent remedy for these conditions. By the use of such a system any number of stations may cut into the same control circuit; that is, messages may be sent from distant points by the use of a relay circuit, similar to those commonly used in wire telegraphy. For simplicity, a line with only three sending stations will be here described.

A radio remote-control system ordinarily requires two distinct circuits: one for the actual operation of a distance-transmission apparatus, and the other a simple wire-telegraph circuit, by which the several stations communicate with each other. For the latter apparatus, it is, however, better to use buzzers instead of telegraph sounders, in order that practice in using the communication circuit may be of benefit in receiving radio messages.

There are a number of possible "hook-ups" suitable for the purpose; two of them are shown in the illustration. Both circuits make use of the type of key which is commonly used for telegraphy all over the world, except in the United States, and is particularly adapted to short-distance work, requiring no battery power when at rest, and no switches to bother with. This type of key has three wire connections instead of two; when the key is at rest, one circuit remains permanently closed, this position corresponding to the ordinary telegraph sounder when its switch is closed. When the key is pressed, the circuit through the rear contacts is broken, and another circuit is completed, at the same time, through the front contact. An ordinary Morse telegraph key can be altered for this use by providing a back contact; to make this, bend a short piece of sheet copper into the shape of a miniature doorstep, and fasten it so that the step overlaps the key base, from which it should be well insulated. A makeshift key like this was used successfully for some time in a circuit in France, which controlled a great Franco-American radio plant during the war.

A Good Radio-Sending Set Is Not to be Had without the Expenditure of Considerable Money. In View of This, It is Suggested That Three or More Radio Amateurs Combine Their Funds, Purchase a Good Sending Outfit and Use It Jointly by Means of a Simple Remote-Control Circuit. The Cost of Such a Circuit Is Not Great, and There Is Nothing Difficult about Its Construction



The simpler circuit is illustrated in Diagram 1. Only one wire of copper or iron is required to be strung connecting the three stations, and but one set of battery cells at each place. This plant is economical, but rather unsatisfactory, inasmuch as there are switches to throw; if one of the three operators neglects his switch, then his friends are out of luck. Diagram 2 shows a circuit which requires no switches, but which, on the other hand, requires two connecting wires from station to station, and in addition two sets of battery cells at each station except the one where the sending apparatus is located, this being marked Station C on the diagram.

The operation is nearly the same for both circuits. When A wishes to send a radio message, he first switches on his buzzer and depresses the key, and sends along to C the signal agreed upon as indicating that he wishes to send a message. As the buzzer switches are normally closed, the buzzers at the other stations respond to this signal, and operator C is thus requested to start his generator. When the set is ready, C tells A over the buzzer line to go ahead. A now throws his switch to form a circuit between his key and station C, if the circuit is connected like Diagram 1, or merely turns to his control key, if Diagram 2 is used. The impulses sent by the key operate the radio-sending circuit by means of a relay. This instrument may be an ordinary telegraph relay, or an old telegraph sounder patched up; the main requirement is that the local contacts shall be extra-heavy. These local contact points of the relay are connected in parallel with the main radio-sending key, as shown to the right in the drawing. Thus, when the relay contacts are closed by the current coming from A's key, the effect is the same as that of closing the radio key itself, and, in consequence, a radio signal is sent out. When the message is finished, A tells C over the buzzer wire to close down his generator.

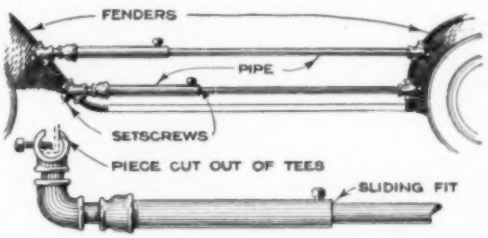
In selecting a type of buzzer for this purpose, it is wise to buy the very best and strongest; the winding should be of at least 20 ohms' resistance. Receiving practice by means of this buzzer line has the advantage of creating no disturbance in the neighborhood, either in the way of sound or radio waves.

The batteries used may consist of either dry cells or ordinary sal-ammoniac cells. The number of cells required should be determined by experiment. Build the control line first; then try one cell at station A or B, and add a cell at a time until the control relay at station C responds with a snap. Whatever number of cells is found to be required, an equal number will probably be required at the other remote station. It should be remembered that C requires no battery for the control circuit in case Diagram 2 is used. Wire up the buzzer circuit, and test it similarly; it may not require as many cells as the control circuit.

There is no reason why radio remote control should not become quite popular with amateurs, as it is already in high favor among professionals.

Luggage Carrier for Auto Made from Pipe and Fittings

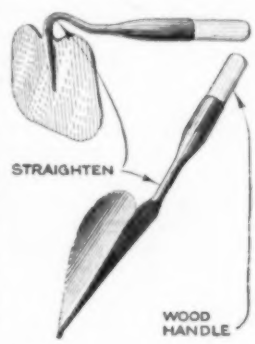
A neat and effective luggage carrier can be constructed very cheaply from iron pipe and fittings, as shown in the drawing. The smaller pipe, which is preferably ½ in., slides easily in the larger one, and is adjustable to any length, while the slotted tees can be turned to conform to the angle of the fenders.



A Neat and Effective Carrier for the Tourist's Baggage and Equipment on the Running Board, can be Made from Pipe and Fittings

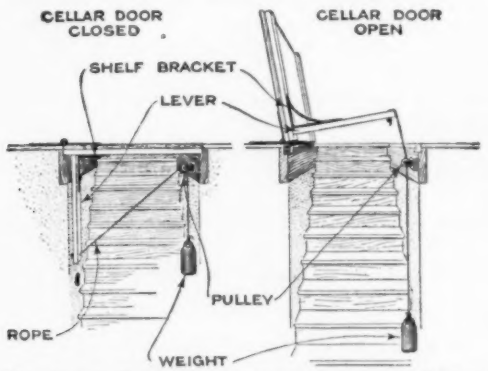
Trowel Made from Hoe

An old hoe, that has had its corners worn round, can be converted into a substantial garden trowel. The wooden handle is removed, and the hoe straightened out, the corners being cut off with a cold chisel; the edge is ground off straight and sharp on a grindstone, and the blade is curved to form the trowel. A short wooden handle completes the tool.—J. G. Allshouse, Vandergrift, Pa.



Concealed Cellar-Door Lift

The usual unsightly, exposed counterweight for relieving some of the effort necessary to raise a heavy cellar door



The Usual Exposed Counterweight, for Relieving Some of the Effort in Lifting a Cellar Door, can be Easily Hidden from View

can be easily hidden from view, without diminishing its effectiveness. As shown in the drawing, a wooden arm the width of the cellar opening, is placed at right angles to the underside of the door, near the edge next the hinges, a shelf bracket being used in the angle, as a brace; on the wall directly opposite, and just beneath the door, a pulley is located. The rope is attached to the outer end of the arm and is passed over the pulley, the other end of the rope having the counterweight attached to it.—D. G. Barnett, Mt. Summit, Ind.

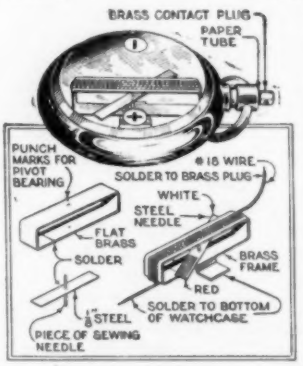
Reducing Culls in Apple Orchards

The owner of a large number of apple trees is forced by business reasons to acquire a thorough knowledge of the orchardist's lore; he becomes a professional. The owner of a few trees usually remains an amateur and knows few, if any, of the kinks of apple culture that are commonplace to the experienced grower, but these little kinks count even when only a few trees are owned. It was so with the man who had two big, thrifty apple trees in his backyard. These trees always set fruit well, but summer hopes always gave way to harvest disappointment; the apples never colored well, and a large portion of them dropped off before the time for picking. Instead of taking these deficiencies as a matter of course, the "backyardist" consulted a professional fruitgrower, a man who had several thousand trees and had grown old in the business. He received suggestions which, taken together, solved the problem for him. Thinning was one of these; the idea of picking green apples in summer and throwing them away, is hard for many orchardists to reconcile themselves to, but veteran growers declare there is hardly any orchard operation that pays so well. Picking the "runts" and culls by hand in summer, cuts down the percentage of culls in fall, and vastly increases the size and quality of the remaining fruit. The professional grower suggested at least two pickings, better still, three; this would check the dropping. The apples picked the first time would be the ripest and best colored; leaving them in small piles on the ground, in the sunshine, would help them to color more. Still another suggestion was pruning; "let more sun into the tree," he advised, "open up the top. Before ripening time, prune out some of the small, leafy branches." The windfall problem is always accentuated by tall limbs which whip. Cutting these back tends to reduce the number of windfalls.

Following these suggestions, the home orchardist converted trees which had been principally an aggravation into trees which gave real satisfaction.—John T. Bartlett, Boulder, Colo.

To Make a Watchcase Galvanometer

A convenient galvanometer and pole tester may be made from an old watchcase. A strip of brass, about ¼ in. wide, is bent to form a narrow rectangular frame, the ends of which are soldered after two punch marks have been made as bearings for the needle. A short crosspiece is soldered across the bottom, as shown, for soldering to the watchcase. Wind the frame with from four to eight turns of No. 18 gauge bell wire. The needle is made from a strip of ⅛-in. steel, which is drilled at the center and soldered to a short piece of an ordinary sewing needle for a pivot. When finished, the needle is sprung into place with the ends of the pivot resting in the bearings made by the punch marks. One end of the needle is painted red and the other

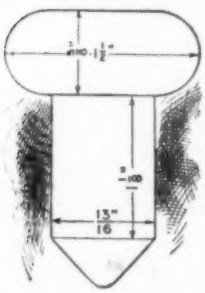


white. The winding stem is removed from the watch, and its place is taken by a tight-fitting brass plug, insulated from the watchcase by a paper tube. The brass frame and one terminal of the coil are soldered to the bottom of the watchcase, the other terminal to the brass plug. Test the instrument with a dry cell and, underneath the glass, paste, at diametrically opposite points, two small pieces of paper marked with the conventional positive and negative signs, as indicated by the side to which the red half of the needle turns.

The first passage of current through the coil will magnetize the needle. Sudden application of current, or heavy currents, without suitable resistance between the source and the instrument, are likely to reverse the polarity of the needle and make readjustment necessary.

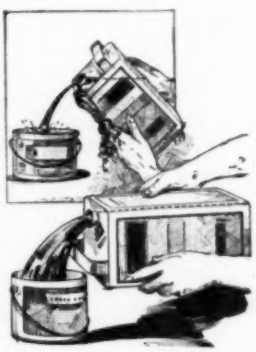
Top Spins by Whipping

A top that will keep spinning as long as it is "whipped" is easily made from a piece of hard wood by following the dimensions shown in the drawing. For a whip, use any piece of soft cord about 2 ft. long, tying one end of it to a stick of about the same length. Wrap the cord around the top and carelessly toss it out, to make it spin. When it has almost stopped, "whip" it gently; the cord will wrap itself around the top, and drawing the whip away gives the top a new start.



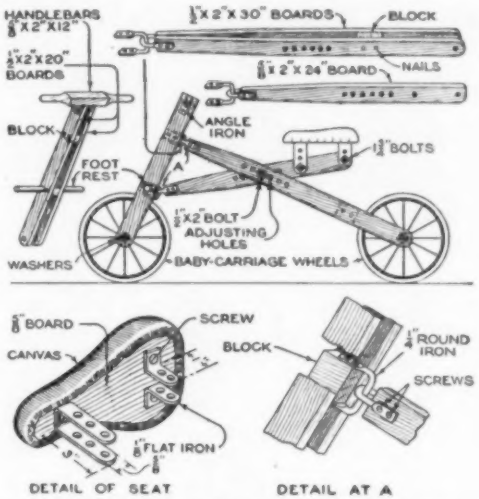
Pouring Liquids from Cans

In pouring varnish and other liquids from cans of the type shown in the drawing, many people waste a large part of the contents or at least spill it over their hands. By turning the can so the outlet is at the top of the can and then tilting it, all spilling and mess can be avoided.—Howard D. Wildman, Schenectady, N. Y.



Children's Adjustable Pushcycle

Boys between the ages of five and ten years hate to do "girlish" things, such as



A Pushcycle will Furnish Sport for the Small Boy and Teach Him to Balance, in Anticipation of the Day When He will Own a Real Bicycle

riding three-wheeled velocipedes, and their chief ambition is to own a bicycle, which few boys are allowed to do, owing to the dangers of the streets, and to the fact that they soon outgrow a bicycle suitable to their age. The pushcycle shown in the drawing will fill the gap, and can be readily made from a pair of wheels from an old baby carriage and strips of wood. As shown in the drawing, this cycle has all the features of the regular article with the exception of pedals, chain, and sprockets, the device being pushed along by the feet of the rider. As the owner grows older, and larger, the height of the seat is readjusted by removing the bolt at the center and putting it in another hole; for smaller children, the seat is brought nearer the ground in the same manner.

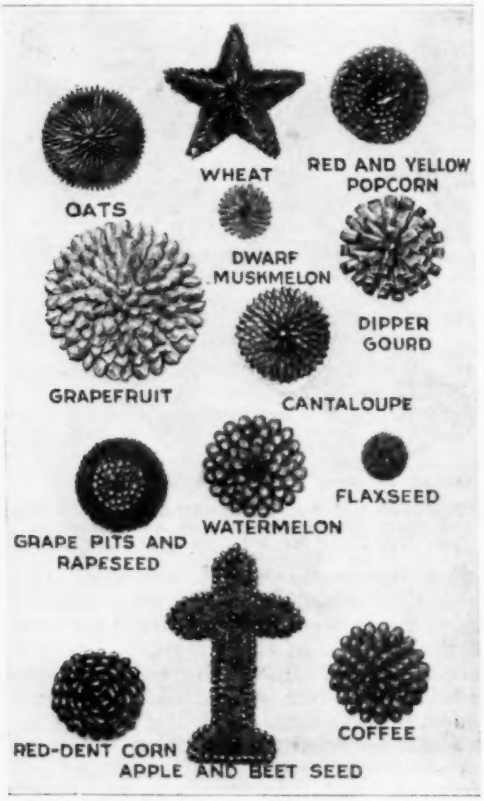
Acetylene as Camp-Fire Fuel

An enthusiastic automobile tourist carries with him on his trips into the virgin timber a tank of acetylene gas, a 10-ft. length of rubber hose, and a burner from a gas range, with a hose nipple attached.

When meal time arrives, the outfit is placed on the ground, and if rocks are handy, the burner is elevated 2 or 3 in. and other stones are piled around the burner to support the cooking utensils. The valve of the tank is turned on, the gas lighted at the burner, and the meal prepared.

Attractive Designs Made of Seeds

The remarkably "real"-looking flowers shown in the photograph were all made



A Collection of Flowers and Ornamental Designs Made by Gluing Various Seeds and Grains to Cardboard

from various seeds and grains. The star is made from grains of wheat and was especially difficult to make because many of the grains on the points of each layer and the top were mitered. The cross is made from apple pits and beet seeds, the soft brown tones being peculiarly pleasing.

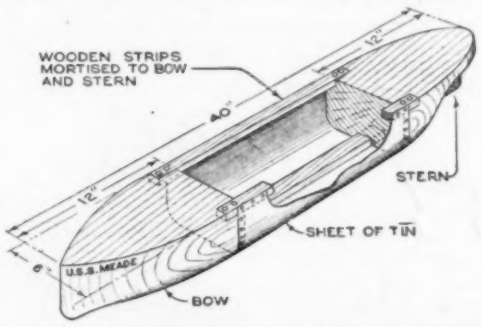
In making the flowers, a disk is first cut from cardboard and the seeds are applied around the edge with glue. The center is then built up with one or more layers of cardboard and the layers of seeds are applied until the design is finished. Beautiful effects are obtained by combining seeds of varying colors in the same design, and as shown in the photograph, quite faithful reproductions of such flowers as zinnias, dahlias, asters, and others are possible. Wire stems may be fastened to the back of the disks to form bouquets. — Clark Cooper, Cañon City, Colo.

Growing Colored Wood

Some interesting experiments have recently been conducted to show the possibility of coloring wood, so to speak, "on the hoof," the wood being colored through the absorption of aniline dyes before the tree is cut down. A slanting hole is drilled completely through the tree with an auger, and the lower end is closed with a plug. A very strong solution of aniline dye and water is poured into the hole and, as the mixture is absorbed by the tree, it is replenished from time to time. The amount of dye solution depends entirely upon the kind of tree; in some cases about a gallon a week is taken up and in others almost as much in a single day. The outer layers of the trunk are soon tinted, but a few weeks must elapse before the wood is colored to the heart. When the tree is cut down, it is found that the wood has been permanently and evenly dyed in the shade that has been employed, and is ready for use. Inasmuch as the dye has worked into the cellular tissue of the growing wood there is no possibility of cuts and scratches showing. This experiment is best conducted in the spring, when the sap is rising in the tree.—S. Leonard Bastin, Bournemouth, Eng.

Building Model Boat Hulls

The amateur naval constructor speedily learns that a boat hull is no simple thing to make, easy though it may look. However, by carving the bow and stern from blocks of wood and using tin, or other sheet metal, for extending the hull, a very satisfactory piece of work is obtained. After the bow and stern have been com-



An Easy Method of Building Model Boat Hulls will Find Considerable Favor among Amateurs

pleted, they are joined together at the desired distance apart with wooden strips; one at the bottom and one at each side,

as shown in the drawing. These strips fit flush into mortises that have been cut in the blocks to receive them. The open space between the stem and stern is closed by tacking a sheet of tin to the strips and wooden ends, with strips of rubber between to make water-tight joints. A wooden deck may be provided, and, if desired, masts, funnels, gun turrets, and other gear, may be added, depending on whether one is building a battleship or a merchantman.

Weatherproof Plant Record

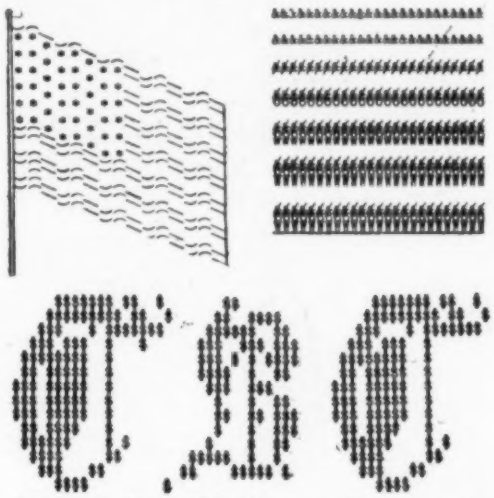
To keep the name, purchase record, etc., of perennial plants, trees, and shrubs connected with the right plant is a difficult matter, and the record is generally more or less illegible. However, by making the record on strong paper with India ink and slipping it, right side out, into a small glass vial which is corked and attached to the plant or shrub, the gardener knows that the name and record of his plant can always be found.

Walking up a Rope

Attempting to salvage a cover that had blown over the edge of a bridge, a truck driver fastened a rope to the bridge rail and descended, so rapidly that his hands were badly burned, and he could not climb back. The driver's helper, on the bridge, was unable to pull him up, but in the face of the situation, the helper took the rope, which was of ample length, and made loops in each end; both ends were lowered to the man below. The middle of the rope was wound once around the bridge rail, and held by the helper. The driver placed his feet in the loops, and raised one foot at a time, as though walking. As each leg was raised and the weight taken from that end of the rope, the man on the bridge pulled it enough to take up the slack. This operation was repeated until the driver reached the bridge.—F. McKissick, Tehama, Calif.

Tricks with the Typewriter

A common typewriter, besides its usefulness as a writing machine, can be made



Among the Designs Which can be Made on an Ordinary Typewriter Are the American Flag, Lines of Soldiers, and Various Kinds of Fancy Lettering

to produce various artistic and comical designs. A few of these are shown in the illustration, which was photographed directly from typewriting, no other means being employed for drawing any part of it.

The characters "X" and "$" are the most useful for designing fancy letters, samples of which are shown in the illustration. These are made with the dollar sign only, and regular single-line spacing is used to give the vertical distance between the characters. The representation of a flag is also produced almost entirely by characters with regular spacing. This will be apparent if the picture is turned on its side. It will then be seen that each character is directly under another, as necessarily produced on a typewriter. For the straight lines, and the small "o" which forms a knob at the top of the flagstaff, the machine must be set so that the carriage turns free, and lines are then drawn with the underlining key. The stars are made by the asterisk of the typewriter; machines which are not provided with this character are therefore not as well adapted for flag drawing, though the small "x" may be used for the purpose.

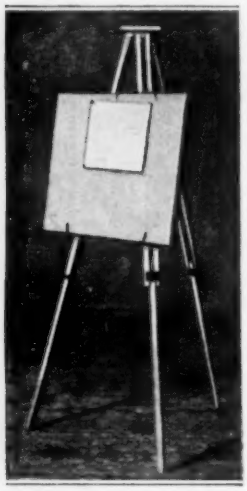
To the right of the flag are illustrated the successive steps by which a row of soldiers carrying guns is represented. For this, the carriage must turn free, and a little practice will be necessary in order to set the carriage so that the various characters will fit together properly.

Those used are, in their order, the "&," the diagonal line, the small "o," the small "w," the quotation mark, and the underlining key.

Various other combinations will occur to the typewriter artist, and by sufficient practice pictures of almost any object can be drawn in this manner.

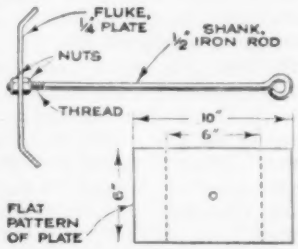
Camera Tripod Makes Artist's Easel

A drawing or sketching easel is readily made from an ordinary photographer's camera tripod, or stand, and two pieces of fairly heavy wire, each about 1 ft. long. Each of the wires is bent to form an S-shaped hook, one end of each being inserted in the opening in which the extension legs of the tripod slides. The bottom of the sketch board is held by the hooks, and the top is supported against the tripod legs. The board may be tilted at any angle by adjusting the third leg of the tripod, while the height is regulated by lengthening or shortening the extension legs, as when used with a camera.—Rev. A. Schaal, Red Cloud, Neb.



Strong, Light Anchor for Rowboats

The majority of anchors used for small boats are of the rock variety—a heavy stone tied to the end of a rope; this form of anchor is anything but satisfactory, as after it has been used a few times the rope stretches, and the rock drops out. To eliminate this annoyance, the anchor shown in the drawing was designed. One end of the shank is threaded, and the other is bent to form an eye. After the iron-plate flukes have been formed, a hole is drilled at the center to accommodate the shank. To assemble the anchor, a nut is screwed onto the threaded end of the shank as far as it will go, the fluke piece is placed in position, and another nut is turned up tight against the bottom; the end of the shank is upset to prevent the nut from backing off. Such an anchor, although small and light, will take a firm grip on the bottom, and will be found much more satisfactory than the rock type.—Frank W. Harth, New York, N. Y.



Removing Molded Letters from Bottles

It is sometimes desirable to erase molded letters from commercial bottles, and an easy method of doing this is simply to lay a sheet of rather coarse emery cloth on a flat surface and to rub the letters over it.

A few minutes suffices to remove the letters, and in addition, a frosted surface is left on the bottle, which can be written on with pen or pencil.

Printing on Leaves

Leaf printing is an interesting pastime for early fall, the printing being done on plants that have a highly colored autumnal foliage. The printing is done by pasting letters or designs, cut from rather thin paper, on the leaves to be printed while the leaf is still green, or before it has shown any great change in color. When the leaf has colored to the desired degree, the paper shapes are removed by soaking in water.

Applying Poultry Netting Properly

To the unexperienced, nothing seems to be easier than to build a chicken run and inclose it with mesh poultry netting, but the job usually lacks neatness. The proper way to apply the netting, according to an expert poultryman, is to attach the top wire first, in a perfectly straight line. When this is done, begin at the bottom of the center post to fasten the lowest wire, and work out to one end. When half of the netting has been secured, the other half is similarly attached, working out from the center.

MINING TOWN SPREADS HAPHAZARD AROUND HILL

IT would be hard to find a better illustration of the influence exerted by terrain on unguided city development than this photograph of a mining community near Pittsburgh, Pa. The slopes of the dominating hill in the background are girdled by irregular roads, and along these the houses have been built. The result is a mazy layout that is as offensive to the eye as it is inconvenient to the inhabitants. The ugliness of the scene is aggravated by the crowding and dreary similarity of the dwellings.

OPPORTUNE ANNOUNCEMENTS

Whenever prize competitions mentioned on this page are conducted by a public institution, the name and address will appear with the announcement. Industrial addresses will not be published, but may be obtained from our Bureau of Information by request, mentioning the title of the article and date of publication.—Editor.

POSITIONS IN GOVERNMENT SERVICE FOR HIGHWAY ENGINEERS

Highway engineers under 35 years of age are needed by the government, and application for examination may be made to the U. S. Civil Service Commission or one of its local boards up to closing time, September 9. The salary at appointment ranges from $2,100 to $2,700, with a temporary allowance of $20 a month for those appointed at $2,500 or less. Applicants are to be rated 45 per cent for education and preliminary training, including at least six years in civil engineering, and 55 per cent for experience and fitness, as indicated by sworn statements and evidence submitted. The work includes superintending road construction, inspecting roads, materials, plans and specifications, and coöperating with state road departments.

NAVAL RADIO STATION SENDS SCOUT MESSAGES TO AMATEURS NIGHTLY

Official messages from the headquarters of the Boy Scouts of America are now being sent out every night by wireless from the New York naval radio station, beginning about 9:30 eastern standard time. Amateur receiving stations with vacuum-tube detectors and amplifiers are able to receive these messages at practically any point in the country, and a dozen stations in California are finding no difficulty in taking them. They are transmitted by the spark system on a 1,500-meter wave length, at the rate of 10 words a minute, preceded by the call, "OST OST OST de NAH NAH NAH Amateur Broadcast," and the number of the code, if any is used. Scout organizations are being urged to take full advantage of the new privilege by setting up vacuum-tube receiving stations wherever possible. The messages will be relayed by various low-powered city stations for the benefit of amateurs equipped only with crystal-detector receivers.

AUTO, PLANE, AND POLO CONTESTS IN WESTERN PRIZE CARNIVAL

Auto races up Pikes Peak, airplane races around it, and polo contests in its shadow, make up the unusual program of a huge carnival of sports to be held in Colorado the week of September 6. A $5,000 cup of gold and silver and $3,000 in cash are the prizes offered for the 13-mile auto race, from Crystal Creek to the summit of the peak. The polo championship west of the Mississippi is to be decided among 12 or more nationally known teams from all parts of the country, and many valuable trophies are offered. The airplane races, from Denver to Colorado Springs and aroumd Pikes Peak, are expected to be spectacular in the extreme and, with the polo contests, will occupy several days.

EX-SERVICE MEN OFFICIALLY DEAD FORM NEW LIVE CLUB

Two ex-service men of Alabama, both of whom had been reported dead by the War Department, are responsible for a movement to organize a new and strange club of World War veterans. The chief requirement is that each member shall have been included in some official list of fatalities during the war. Of these men, practically all of whom escaped their reported fate only by imprisonment or some other adventure, there are declared to be about 20 in the Birmingham district alone, and the first organization will be formed there.

MOVABLE SANITARIUM VISITS PATIENTS AT HOME

IN the endeavor to supply sanitarium facilities to tubercular patients in the rural districts, without the expense of a large central building, a society that is fighting the white plague in Jay County, Ind., has hit upon a novel and highly effective method. The plan amounts virtually to equipping a hospital room with wheels, and drawing it from place to place by a farm tractor, each patient's yard serving as its temporary site.

The Movable Hospital Room at Rest and Ready for Service, with Its Stairs Let Down, Its Window Shutters Propped Open to Form Awnings, and the Visiting Nurse on Duty

Interior View of the Little Sanitarium on Wheels, Showing the Standard Hospital Bed and the Simple Table, Chair, and Stove

Extreme simplicity marks the construction and equipment of these little one-room cottages, the cost having been kept down to about $180, with an additional $75 for furnishings. The outside dimensions are 8 by 12 ft., the inside being 6 in. less each way. At one end are a door and two windows, and in each of the other sides one window, the rear one being 42 in. from the floor to keep the bed out of a draft. All openings are screened, and wood covers, hinged at the top of the windows, act as awnings and rain shields when propped open. A standard hospital bed, a side table, a serving table, a stove, and a rocking-chair furnish the room. The house is painted white, and the asbestos-shingled, overhanging roof green. The four wheels have tires of 3½-in. face, to avoid road injury. Plain and inexpensive as it is, the portable hospital room has the inestimable advantage that it permits the patient to remain in his own dooryard. It has been found useful, too, in handling certain quarantine cases without removing the subject from the home influence. Estimating six moves a year, the little structure is calculated to be good for at least 10 years of service.

TWO NEW VARIETIES OF RICE DEVELOPED IN SOUTH

As the best of 2,000 varieties studied, two kinds of rice, known as Acadia and Fortuna, are now being grown for the second season at the Louisiana station maintained by the Department of Agriculture. Last year, from a 48-acre tract planted to Acadia the workers at the station obtained an average yield of 5,155 lb., while from 35 acres of very "old" land an average of 2,775 lb. of Fortuna was harvested.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]